# INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Vol. 22
No. 10

PUBLISHED MONTHLY BY THE BRUCE PUBLISHING COMPANY, 524-544 NORTH MILWAUKEE STREET, MILWAUKEE, WISCONSIN.
*Eastern Office: 40 E. 34th St., New York, N. Y. — Western Office: 66 E. South Water St., Chicago, Ill.*

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### AN INVITATION

The school year with its many duties, responsibilities, cares, and diversions, is well on its way when this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION comes into the hands of the shop teacher.

Throughout the year, many things occur in individual school shops that would be of great interest to other shop teachers. If you have a news item that might interest your fellow teachers, send it to us and we will gladly pass it on to our readers.

### A FAIR QUESTION

Some subscribers have asked why the subscription prices of their favorite magazines have not been reduced during this period of economic stress. The publisher's answer is contained in an editorial on this subject on page 312.

### THIS MONTH'S COVER

The boy upholsterer in the picture chosen for the October cover of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION evidently knows how to go ahead with his job. He has *learned how* in one of Buffalo's school shops.

Photo by Hiram E. Greiner, Buffalo, New York.

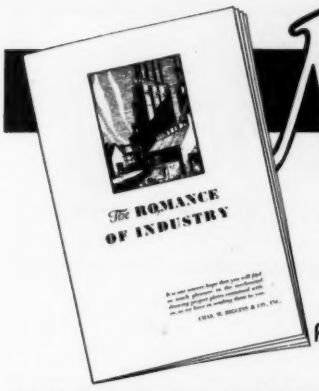
*Articles Indexed*—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."

Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1933, by Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930.

*Subscription Information*—Subscription price, $2.50 per year, payable in advance. Canadian postage and tariff, $1.00, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notices for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

*Editorial Contributions*.—The Editor invites contributions bearing upon Industrial Arts, Vocational Education, Manual Training, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

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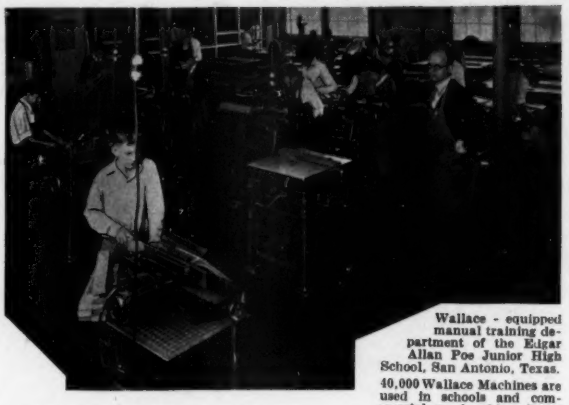

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
October, 1933
Vol. 23, No. 10

# Facts for Educational Planning

## George K. Wells

*State Supervisor of Industrial Education, Indianapolis, Indiana*

*Facing the facts is always wholesome. The author indicates how facts about professions, trades, and occupations may be obtained and used for vocational-guidance purposes and for planning the work given at vocational and technical schools.*

WHENEVER educational planning is done, all available factual material that is related to the problem should be gathered. In planning the finding courses, vocational-guidance courses and vocational courses for any school system, the employment possibilities for the state and the community are important.

In this article an attempt has been made to show the relation between the occupational trends and the planning of such courses. The changes in trends of occupations over a period of twenty years should be sufficient to indicate rather definitely what the major occupations are likely to be over the next ten years, particularly if they are studied in relation to present occupational tendencies.

Because the increase and decrease in numbers employed indicates trends, the total number employed in 72 occupations for men and 22 for women, for which comparable data can be secured, and their relation to the total employed population, has been studied.

Because this study[1] was made in Indiana, the facts shown in the table apply only to that state; however, anyone may make use of the method to secure the facts about his own state or community. Table I indicates the size of the group in relation to other groups, its increase or decrease over a period of twenty years and in the last column the number of men or women employed per 1,000. This last figure of the number per 1,000 employed men or women is important because it makes possible the method used in estimating the number that might be employed each year over a period of years. In a second table, not shown in this article, the author listed the other occupations for men and women for which there was no comparable data over the twenty-year period. These were figured also as to the number per 1,000 employed men or women.

*Facts to be considered in interpreting the data.*

In interpreting the data secured from this study it must constantly be kept in mind that it is of value when studied in relation to other known facts that have a bearing on the subject. The 72 occupations for men listed do not include all of the things that men work at. We must, therefore, study the relation between them and the total employed population. We must remember that the total population of the State of Indiana has increased 20 per cent over a period of twenty years.

| OCCUPATIONS — MEN ONLY | 1930 | Rank | Increase-Decrease 1910 to 1930 | Per Cent Increase-Decrease 1910-1930 | Number per 1,000 Employed |
|---|---|---|---|---|---|
| Farmers | 161,656 | 1 | -32,417 | -16 | 159 |
| Farm laborers (working out) | 65,301 | 2 | -14,197 | -18 | 64 |
| Retail dealers | 38,500 | 3 | 6,807 | 21 | 38 |
| Salesmen (stores) | 37,551 | 4 | 20,418 | 119 | 37 |
| Machinists and millwrights | 27,970 | 5 | 10,560 | 61 | 27 |
| Clerks (except in stores) | 25,616 | 6 | 16,093 | 169 | 25 |
| Chauffeurs, truck and trailer drivers | 25,585 | 7 | 25,266 | 4,809 | 25 |
| Carpenters | 24,386 | 8 | 101 | 0 | 24 |
| Extraction of minerals | 21,090 | 9 | -3,118 | -13 | 21 |
| Farm laborers (home farm) | 19,913 | 10 | -25,785 | -56 | 19 |
| Foremen and overseers (manufacturing) | 11,466 | 11 | 6,505 | 131 | 11 |
| Painters, glazers and varnishers (building) | 11,214 | 12 | 3,014 | 37 | 11 |
| Managers and superintendents (manufacturing) | 7,975 | 13 | 5,731 | 184 | 8 |
| Electricians | 7,560 | 14 | 3,995 | 111 | 7 |
| Teachers (school) | 7,452 | 15 | 1,660 | 28 | 7 |
| Insurance agents and officials | 7,198 | 16 | 3,851 | 116 | 7 |
| Commercial travelers | 6,948 | 17 | 1,318 | 23 | 6 |
| Bookkeepers and cashiers | 6,301 | 18 | -561 | -8 | 6 |
| Plumbers, gas and steam fitters | 5,913 | 19 | 2,989 | 101 | 5 |
| Clerks in stores | 5,685 | 20 | -1,067 | -15 | 5 |
| Engineers (stationary) | 5,696 | 21 | -1,573 | -22 | 5 |
| Molders, founders and casters | 5,548 | 22 | -384 | -7 | 5 |
| Builders and building contractors | 4,804 | 23 | -1,007 | -18 | 4 |
| Blacksmiths | 4,795 | 24 | -3,809 | -44 | 4 |
| Clergymen | 4,744 | 25 | 865 | 10 | 4 |
| Painters, glazers and varnishers (factory) | 4,840 | 26 | 900 | 27 | 4 |
| Compositors, linotypers and typesetters | 3,999 | 27 | 1,438 | 56 | 3 |
| Physicians and surgeons | 3,908 | 28 | -1,141 | -22 | 3 |
| Brick and stone masons | 3,897 | 29 | -8 | -0 | 3 |
| Quarry operatives | 3,878 | 30 | 958 | 33 | 3 |
| Lawyers, judges and justices | 3,747 | 31 | 153 | 4 | 3 |
| Real estate agents and officials | 3,709 | 32 | 898 | 32 | 3 |
| Firemen (except locomotive and fire department) | 3,698 | 33 | 344 | 11 | 3 |
| Delivery men | 3,688 | 34 | -1,804 | -33 | 3 |
| Accountants and auditors | 3,518 | 35 | ... | ... | 3 |
| Bakers | 3,106 | 36 | -865 | -28 | 3 |
| Conductors (steam railway) | 3,095 | 37 | -858 | -37 | 3 |
| Brakemen | 2,953 | 38 | -480 | -15 | 2 |
| Cabinetmakers | 2,852 | 39 | 698 | 32 | 2 |
| Waiters | 2,794 | 40 | 1,672 | 84 | 2 |
| Policemen | 2,603 | 41 | 1,348 | 107 | 2 |
| Tinsmiths | 2,598 | 42 | 435 | 20 | 2 |
| Rollers and roll hands | 2,584 | 43 | 1,575 | 115 | 2 |
| Draftsmen | 2,440 | 44 | 1,629 | 289 | 2 |
| Masters and mariners | 2,291 | 45 | 1,210 | 104 | 2 |
| Firemen (fire department) | 2,249 | 46 | 1,250 | 116 | 2 |
| Telegraph and telephone linesmen | 2,109 | 47 | 1,022 | 97 | 2 |
| Upholsterers | 1,984 | 48 | 1,385 | 843 | 1 |
| Dentists | 1,967 | 49 | 883 | 82 | 1 |
| Boiler makers | 1,804 | 50 | -7 | -0 | 1 |
| Plasterers | 1,801 | 51 | -148 | -7 | 1 |
| Shoe makers and cobblers | 1,777 | 52 | 121 | 7 | 1 |
| Civil engineers and surveyors | 1,666 | 53 | 738 | 79 | 1 |
| Musicians and music teachers | 1,470 | 54 | 250 | 20 | 1 |
| Apprentices | 1,458 | 55 | -1,125 | -48 | 1 |
| Wholesalers, dealers and importers | 1,390 | 56 | 419 | 43 | 1 |
| Tailors | 1,386 | 57 | -858 | -58 | 1 |
| Sawyers | 1,358 | 58 | -178 | -11 | 1 |
| Paper hangers | 1,383 | 59 | -118 | -8 | 1 |
| Undertakers | 1,183 | 60 | 376 | 46 | 1 |
| Pattern and model makers | 1,049 | 61 | 405 | 54 | 1 |
| Stone cutters | 962 | 62 | 186 | 15 | -1 |
| Editors and reporters | 900 | 63 | 89 | 6 | -1 |
| Railway mail clerks | 871 | 64 | -58 | -7 | -1 |
| Conductors (street railway) | 850 | 65 | -858 | -65 | -1 |
| Photographers | 841 | 66 | -166 | -30 | -1 |
| Veterinary surgeons | 824 | 67 | 28 | 4 | -1 |
| Stenographers and typists | 849 | 68 | -844 | -50 | -1 |
| Millers (flour, feed, grain) | 833 | 69 | -848 | -51 | -1 |
| Baggage and freight agents | 488 | 70 | -47 | -9 | -1 |
| Glass blowers | 806 | 71 | -8,179 | -83 | -1 |
| Coopers | 166 | .72 | -588 | -77 | -1 |

*Table I. A list of 72 occupations for men in Indiana according to the 1930 census. — Total male working population in the year: 1,015,761. — The minus sign in the last column should be read, less than one*

[1] *Bulletin No. 109*, by George K. Wells, published by State Department of Public Instruction, Indianapolis, Indiana.

If the number employed in any occupation remains the same over the period it is really losing ground, because it would have to increase in order to keep up with the gain in population. Consideration for educational purposes should also be given to the relative importance of the occupation as compared with others of the group.

*Outstanding factual data.*

In order to conserve space no discussion of the outstanding facts will be given, but listed below are some of the facts that show up clearly.

1. The farmer and his employees make up the largest single group.
2. The industrial field is extremely varied but the occupation of machinist and carpenter rank far above the others.
3. The cabinetmaker ranks 39 in the list of 72 occupations for men and employs only 2 out of every 1,000 men.
4. In the commercial group, over 90 per cent are more interested in selling or salesmanship than in shorthand, typewriting, and bookkeeping.
5. There are only 549 men stenographers, which is less than one per 1,000.
6. All of the professional group of men added together make less than 3 per cent of the men employed.

***A suggested basis for estimating the number of new workers needed annually for replacement in any given occupation.***

The school administrator, and in fact any person who has any interest in the welfare of youth, is constantly confronted with the question as to what the occupation of the boys and girls will be after they leave school. No one appears to have any data to prove just how many may find work or just how many are needed to replace those who pass out of a given occupation.

It is probably not necessary for us to know the exact number needed in any occupation. The school program, however, should be adjusted to training, if any definite vocational training is given, a number which could reasonably be expected to find employment in the particular field.

In connection with this problem also is the question as to what shall be the area or territory to be used as a basis of training. Shall it be the territory which immediately surrounds the school, shall it be the state in which this community is located or shall it be the nation? If we answer that the duty of training the youth lies with each community and that other communities are doing the same thing as the local high school, we must believe that the first duty lies in training for the work in the immediate vicinity. It is probable that the next larger unit to be thought of would be the state and the opportunities within that unit. It is quite probable that because we can only hope to give vocational training in a few of the most prominent occupations, we shall find that training that would be in proportion to the occupational needs within our state would be approximate for the needs of other states close to ours.

After making a study of the census figures for Indiana and for many of the larger cities of the state, we have concluded that: first, there is now, and, barring unusual and unpredicted events, will continue to be, a definite number of people in each occupation which number will not change rapidly; second, the pupils who leave our schools will find work in about the same ratio in any occupation that that occupation bears to the total employment.

If these two statements are accepted we may then conclude that if 24 out of every 1,000 employed men in Indiana are carpenters, the opportunity for replacement in the occupation will be not over 24 out of every 1,000 who seek employment after leaving our schools.

There were in the high schools of Indiana in 1932, 81,464 boys. Dividing this number by four we estimate that in round numbers 20,000 boys leave school each year. This number times 24 divided by 1,000 equals 480, the approximate number that might be placed as carpenters.

The formula for this would be:

The possible number entering any occupation equals the number of boys *or* girls leaving school each year times the number per 1,000 men *or* women employed at the occupation divided by 1,000.

Substituting the figures for carpenters, we have:

$$\frac{20{,}000 \times 24}{1{,}000} \text{ equals } 480$$

Of course this estimate is based on the theory that all people leaving school will find employment in about the ratio that people are now employed and that each year all of the people who leave school start at some form of employment. We are well aware of the fact that the conditions at the time these people leave school vary, and that some occupations may employ more than their proportion one year and less the next. We believe, however, that it is a fair basis on which to estimate the requirements of occupations.

If we apply this rule to some of the occupations in the various fields, we have the following results:

*Number that might be employed in Indiana in selected fields*

| | |
|---|---|
| Auto mechanics, including truck and tractor drivers | 880 |
| Draftsmen | 40 |
| Electricians | 140 |
| Machine-shop work, including machine operators | 2,040 |
| Pattern and model makers | 20 |
| Printers (whole industry) | 120 |
| Physicians and surgeons | 60 |
| Dentists | 20 |
| Teachers (schoolmen) | 140 |

This same basis for estimating could be used in connection with the proportion for a given city.

By substituting the number leaving the local high school for the number leaving school in the state, we can get the number for the local community.

This formula is not submitted with the thought that it is the final answer to the question of how we shall guide our boys and girls but we do believe that it provides a reliable starting point to which should be added any other factual data that may be obtained.

# Industrial Education

## A. P. Twogood

*Director of Industrial Education, Newton, Iowa*

*Those who think that industrial arts and vocational education are mere frills and fads lately added to our educational system, show that they know little of the historical development of our American public-school system. This article contains a summary of the earlier history of the movement.*

ECONOMIC conditions have so stirred up the public that attention has been focused upon the schools as the chief spending agency of the public's money, with the result that many who are loudest in their condemnation really know the least about the background of modern education. It is only natural, therefore, that those subjects which apparently have come in since the good old days of the three R's must bear the brunt of the attack. It is interesting to review our history a bit in order to see the historical background of our present industrial-arts and vocational training.

Industrial education, in one form or another, is as old as history. Among primitive peoples it consisted solely of those things which were necessary to provide food, clothing, and shelter. Each individual was concerned only with providing these things for himself and his family, though his responsibility for his family was almost negligible. At an early age the sons were taken on hunting expeditions by their fathers where they soon learned, by imitation, to shift for themselves. Likewise, the daughters learned from their mothers those skills necessary to maintain existence. As the occasion demanded they made clothes from the skins of the animals killed for food, prepared the food for consumption, and also provided shelter in caves or in the form of huts built of poles and covered with skins, grasses, twigs, or bark.

While the Greeks developed craftsmanship of a comparatively high order, they personally had very little to do with it. All work of an industrial nature was done by slaves who had become such as a result of the many wars which the Greeks waged. These slaves, in being compelled to do all the work, developed craftsmanship to a rather high degree, in spite of the contempt in which their overlords held them.

The Romans also looked down upon the crafts, but were more tolerant than the Greeks. As the cities increased in size, specialized labor began to develop as it was discovered that one art was sufficient to maintain the worker.

Among the Jews labor was looked upon as a religious duty, and the Talmud contains many passages emphasizing this point.

In the early Christian monasteries work also was stressed as a great virtue. In most of them manual labor was compulsory, and each monastery became a unit in which all the necessary forms of craftsmanship as well as agricultural labor was developed and practiced. Some of the artistic and beautiful manuscripts prepared and bound in these ancient monasteries are still extant.

Outside of the monasteries apprenticeship was rapidly becoming the chief educational program for the middle classes. It began in the home on the father-and-son basis. It was natural then that when the apprentice system extended beyond the home and brought in another boy he also was to be treated as a son. During the period of apprenticeship, which usually was seven years, the apprentice was to receive shelter from the master, moral, religious, and civic instruction which would make him a good member of society, as well as the mysteries or secrets of the trade for which he was indentured.

In England the apprentice was registered by the town clerk and required to take oath to obey the laws of apprenticeship and of the town. In 1601 the English Poor Law was passed making it legal to indenture the children of poor parents. This was the beginning of child labor in the various crafts, and amounted to virtual slavery. It continued until 1802, when the Factory Act limited child labor to twelve hours daily, between 6 a.m. and 9 p.m. It required the employer to provide instruction in the three R's for these children. The law also provided for sanitary inspection for the factories employing child labor, but there is little evidence that this inspection provision really functioned.

The invention of the steam engine offset the value of the Factory Act of 1802 as it caused the factories to go where child labor could be obtained without meeting the requirements of the act, because factories no longer had to depend upon the rivers and lakes for their water power. This resulted in the abolishment of the apprentice law in 1814. In 1819 a law was passed which provided that no child under nine years could work in a cotton factory, and no child under sixteen could work more than twelve hours daily. In 1825 this age limit was raised from sixteen to eighteen years, and the time limit was set at 69 hours per week.

The Factory Act of 1833 established the principle that labor and education should be combined. Under it, children between the ages of nine and thirteen were required to attend school two hours daily. The responsibility for their schooling rested upon the employer. As a result the schools were poor, and to overcome this a new law was passed in 1844, which established the half-time work and school principle, and placed the

responsibility for educating the children upon the parents instead of the employer. Until 1870 it remained the substitute for compulsory education, at which time the state assumed the responsibility and organized schools.

About 1825 the manual-labor movement in education started in America. The Maine Wesleyan Seminary proposed to unite manual labor and study in such a manner as to make the students self-supporting, and also to pay the operating cost of the school. It offered two courses: one college preparatory, and the other trade preparatory. Schools of this type became quite successful and many of them were started. About the same time schools of similar nature, but different purpose, were being established in England, France, and Germany. These were schools for poor children and orphans. The industrial schools were also looked upon as the proper type of reformatory for juvenile criminals, and this marks the beginning of our modern industrial reform school.

In 1868 Russia established instructional shops along with production shops in connection with the railroads which they were developing. This type of instruction was so organized that it produced remarkable results. The system was demonstrated at the centennial exposition in Philadelphia in 1876 and made such an impression that it was immediately adopted in America. Its extreme formal character, however, made it desirable to supplant it by the Swedish sloyd system, which continued, in a more or less modified form, until about 1910.

In 1820 the first important mechanic's institute in America was formed when the General Society of Mechanics and Tradesmen of the City of New York established a "mechanics' school." It has experienced a steady growth ever since, and is located at present at West Forty-fourth Street. A similar institute in Philadelphia, called the Franklin Institute in honor of Benjamin Franklin, was founded in 1824, and it, too, exists today. The Maryland Institute in Baltimore, the Ohio Mechanics' Institute in Cincinnati, and a similar institute in Boston were established about the same time and also are in existence today.

It is interesting to note the similarity of our modern concepts of industrial arts with those of some of the educators of history. In a pamphlet printed in 1647 entitled *The Advice of W. P. to Mr. Samuel Hartlib for the Advancement of Some Particular Parts of Learning*, Sir William Petty suggested the teaching of many things of an industrial-arts nature. Among the reasons for offering such subjects are these: "They will be less liable to be cheated by artificers" (intelligent consumer objective). "It will keep them from worse occasions of spending their time and estates" (avocational or hobby objective). "They, being able to make experiments themselves, may do it with less cost, and more care, than others will do it for them" (creative objective).

When the Royal Society of London for the Improving of Natural Knowledge was formulated by such men as Sir William Petty, Dr. Christopher Wren, and Robert Boyle, it was recommended that members become acquainted with the "mysteries of manual arts" as a basis for their experiments. Another member of the Royal Society, Joseph Moxon, hydrographer to the King, prepared a series of treatises on mechanical processes, dealing with smithing, hinges, and lockers, heat treating of steel, joinery, carpentry, and wood turning. Later, John Locke, also a member of the Royal Society, "became the chief exponent of the idea that education should fit a boy for a practical life."

Pestalozzi demonstrated that education could be woven successfully around manual arts, and has since been called the "father of manual arts," but because of financial difficulties his numerous schools failed. Fellenberg, who adopted the principles set forth by Pestalozzi, established a school called the "Wylhof" with the objective that "education must prepare each individual to live a useful, happy, and moral life." Pestalozzi joined him in his work, but they separated because of differences of opinions. Fellenberg later started a farm and trade school, a normal school, a school of applied science, a school for girls, and a colony school.

About the same time Froebel adopted Pestalozzi's ideas on education and developed them into his doctrine of self-activity as an educational method. His first school was the Kindergarten in which he stressed the value of handwork as a medium for instruction.

Thus, it is possible to see that the industrial-arts and vocational training which school patrons are inclined to look upon as something new, are really very old.

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# Technical Vocabularies

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***The vocabulary lists which start in this issue will, no doubt, be welcomed by shop instructors.***

ENGLISH must be adapted to the situation in which it is used. All of our better writers and speakers have attained a high degree of excellence in the use of English because they have been careful to fit the language to the subject, the time, the place, and the circumstance. Similarly, English for industrial or

technical use must be adapted to the work required of it. It has its own vocabulary, style, and technique just as English for any other purpose.

It is true that vocational-industrial pupils must broaden their interests by reading good books and remembering what is in them, by studying much that their fellow pupils in other courses study, and by actively participating in extracurricular activities. But inasmuch as the vast majority of them enter industry from the vocational and trade school, they must also be taught in their classes something about industry — its vocabulary, its content, its methods, and its romance. If they are permitted to enter industry without such a background, each one of their teachers is partly to blame. These students must be helped to develop a true perspective, and to maintain a proper balance regarding literary and industrial values.

It is important that pupils should learn the spelling, the meaning, and the correct use of the technical terms or nomenclature in the subjects and trades they study. If the pupil becomes acquainted with the nomenclature used, study of the trade or subject will be easier and more accurate.

It follows that the mastery of the trade or technical terms facilitates and effects a mastery of the important ideas and concepts of that field of knowledge. In any case, a knowledge of trade and subject nomenclature is fundamentally necessary to interpret properly and to understand clearly the subject matter presented in any course. While the lists are not exhaustive, they are sufficiently complete to check and to develop a pupil's concepts in his trade. The lists should, therefore, receive close study. Pupils should learn the meanings of the words they do not know.

**Terms Used in the Automobile Industry**

accelerate
accelerator
accessories
accumulator
acetylene
acid
adjustable
adjustment
alcohol
aligner
alignment
alemite
alloy
alternating current
altitude
aluminum
ammeter
amperage
annealing
annular ball bearing
anode
anticlockwise
antiglare lense
armature
armored cable
asbestos
assembly
automatic
automobile
automotive
auxiliary
axle
babbitt
backlash
baffle plate
balloon tire
battery
Baume scale
bearings
bendix
benzol
bevel gear
blow-out
bookkeeping
boring
brake
brazing
brougham
buckling
bumper
burnish
bushing
cable
cabriolet
cadmium
calipers
camber
camshaft
cantilever springs
capacity
carbide
carbon
carbonize
carburetion
carburetor
carcass of tire
cartridge fuse
case-hardened
cast iron
castellated nut
caster
castor oil
caterpillar tractor
cathode
celluloid
cementing
chafed tires
chamois
chassis
chauffeur
chamfer
check valve
choke
circuit
circulating
clearance
clincher
clockwise rotation
clutch
coil
collision
combustible
combustion
commercial
commutator
compressed air
compression
compensating
condenser
conductance
conduction
conductor
cone clutch
congested
connection
contact breaker
contraction
copper
core
cotter key
counterbalance
counterclockwise
coupé
crankcase
crankshaft
creeper
cut-out
cycle
cylinder
cylindrical
decarbonize
decreasing
defects
deflecting
demagnetize
demountable
denatured
density
dent
depolarize
detonation
diagnosing
Diesel engine
differential
diffusing
dilution
disassemble
disk clutch
discharge
disconnect
disengaging clutch
distilled water
distributor
dome lamp
doped battery
double-acting
drag link
dual ignition
dynamic balance
dynamo
eccentric
electric
electrical
electricity
electrode
electrolyte
electromagnet
electroplate
element
emergency
enameled
engine
equalizers
equipment
ethyl
exhaust
expansion
explosion
expulsion
fabric
felloe
fender
fiber
filament
filter
firing
fixtures
flange
flexible
flux
flywheel
focusing
formula
four-cycle
frame
free-wheeling
freezing point
frequency
friction
fuel
fuelizer
fuse
galvanometer
garage
gasket
gasoline
gauge
gear ratio
generator
glossary
glycerin
governor
graphite
gravity
greasing
groove
grounded
headlight
heavy-bodied oil
helical gear
hexagon nut
high-tension
hoist
honeycomb-type radiator
honing
hood
horse power
hub
hydraulic
hydrometer
idler
ignition
I-head cylinder
impulse
indicator
induction
inflate
inlet
inner tube
inspection
insulated
insurance
intake manifold
intensifier
intermediate gear
internal
interrupter
jack
jet
jobber
joint
junction box
kerosene
keyway
kilowatt
knock
lacquer
lag of ignition
laminated
lapping cylinder
lathe
layout for garage
leaky rings
lens
lenses
L-head engine
liability insurance
license
lining
live wire
lubricant
lubricating
lubrication
lynite
machinery
magnet
magneto
magnetized
make-and-break ignition
mandrel
manifold
manual control
maximum
mechanic
mechanical
mesh
meter
metering pin
micrometer caliper
"miked"
mirror
misfire
mixture
molecule
motometer
motor
motorcycle
muffler
multiple
multipolar
neat's-foot oil
neutral
nickel
nomenclature
nonskid
nozzle
offset cylinder
oil filter
oscillate
overcharge
overhaul
overload
overlap
oversize
oxyacetylene
packing
parallel
parking
passenger
pedal
petcock
pick-up
pinion gear
piston
pitted valve
planetary
plate clutch
platinum
pliers
plunger
pneumatic
polarity
polish
poppet
porcelain
portable
positive
precision tools

primary
priming
principle
prony brake
puncture
radial
radiator
radius rod
ratio
reamer
rear
rebabbitting
reciprocating
rectifier
refacing
reflector
registration
regulation
regulator
relining
repairing
replacement
resistance
retard
reversible
rheostat
riveting
roadster
rotary
rotor
scored cylinders
secondary
sedan
sediment
semifloating
separator
series
service
seven eighths
shellac
shims
shunt
signals
silencer
simonizing
snubber
socket
solder
solution
spark plug
specific gravity
specifications
speedometer
splicing
spindle
spokes
sponge
spraying
sprocket
sprung axle
squeaks
static balance
stationary
steering
storage
suction
sulphate
sulphuric acid
synchronize
synchronous
syphon
tail-light
tappets
taximeter
temperature
tempering
tension
terminals
tester
thaw out
T-head
thermostat
thousandth
throttle
tighten
timing
tire
toe-in
tolerance
tonneau
tools
torque
towing
tractor
traffic
trailer
transcontinental
transmission
tread
truck
tubular
tuning
underslung
universal joint
unvaporized
upholstery
vacuum
valve
vanadium steel
vapor
vaporizer
vent hole
ventilator
venturi
vibration
viscosimeter
viscosity
visor
volatile
volatility
volt
voltage
voltmeter
V-type
vulcanizing
wabble
waste
waterproof
watt
welding
wheel
windshield
winter front
wiring
wrecking
wrench
zero
zinc

## Current Comment No. 8

# Variety in Physical Product

## Homer J. Smith

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*Courses offering a wide contact with materials, methods, and types of work are necessary if the industrial-arts student is to effectively sample industrial occupations.*

FULL realization of our objectives in the industrial arts is dependent upon a number of related conditions. The *offering* is of primary importance. Without rather generous provision of appropriate subjects or courses we cannot hope for high attainment. Next in line is *content*, for values accrue or are sadly lacking by reason of the inclusion or omission of basic instructional elements. Then comes *methods and management* or the complete teaching-learning arrangement.

This third requisite is twofold. We should be concerned equally with *what the teacher does* and *what his pupils do* as the result of his careful planning. An earlier writing in this series urged "Variety in Class Conduct" as a desirable goal for the instructor in industrial subjects. It was asserted that we are too prone to standardize the routine of our teaching acts, that we are not sufficiently versatile in attack to gain the best results. Suggestions were offered as to how we may improve the use of class time through conscious application of what is known of the drives and necessities of students.

It seems equally true that we have become too formal in our assignments of manipulative work and that more variety in physical product would be to great advantage. The criticism falls to some extent upon industrial-arts and trade training alike, but what is written following has more relevance to the former. The more general the aims, the more simple the content, and the younger the students the greater the force of the statements here made. Some instructors are so strongly committed to variety that they would hold it as an ideal throughout the full range of their assignments or the range of the departmental offering. Others, perhaps most of us, would agree to a program of broad base with increased pointing as *Education* passes to *Training* in the life of a boy or a group. The theme of this discussion is that, particularly in the industrial-arts courses and particularly in the junior-high-school years, we should plan a much more varied assortment of things to be done or of experiences to be met.

Teachers of recent training assure themselves that there are included in their courses an increasingly fuller array of the essential *knowing* and *doing* units. Boys are exposed, in good present-day departments, to a much more comprehensive and faithful representation of the fields of industry concerned. It is believed, nevertheless, that further advance can be made toward our announced goals by a better selection of projects and jobs. It is not a matter of better design, which is always a thing of importance. It is not a matter of more useful product, of more sturdy construction, of better finish, and the like. These we must have and to these ends we have worked with marked success. It is a matter of wider scatter, greater difference, and broader application in the things which the boys make and in their consequent manual activities.

If the several industrial occupations are to be effectively sampled there must be attempt in each course,

or in each related series of courses within a given field, to picture more of the materials and the means of real and pay-type work. It is known that good teachers analyze their assignments to guarantee inclusion and progression of the indispensable things. Indeed, their manual requirements — their exercises, projects, and jobs — are synthetic in the sense that they have been selected or designed to afford the desired experiences. But, there is another form of analysis or scrutiny, based upon the social or personal results which we want our subjects to accomplish.

We want the series of assignments to bring in the necessary tools, machines, operations, processes, materials, etc. We want the series, likewise, to do other things equally important or even more important. We want the manipulative acts and programs to render our students not only skillful but informed. We want them to advance our boys toward discerning citizenship as well as toward competency in later work-life. We want them to portray employment types, demands, and interests as well as to fit boys in some measure for earning in selected specialties. In short, we want them to add to the world-wiseness and work-wiseness of our charges.

The *individual projects or jobs* should be retained for their value in teaching things which we have long counted among our specific aims. There can be no substitute, in the beginning of instruction for the project done wholly by one boy with such speed and care and joy as he can develop. These individual jobs can, however, be varied. Some can be seasonal; some can match current interests or unusual personal enthusiasms. Some can be cumulative, that is, worked upon from time to time as new operations are learned. Some may well be in the nature of repair as contrasted with construction. Some can be rough rather than finished. Some can require glue, screws, rivets, or nails rather than one of these almost exclusively in a given shop or grade. Some can be in a combination of materials — mixed woods, wood and reed, wood and metal, wood and electrical fittings, finished in blending colors, etc. Some can be with and others without turned parts. Some can be of individual design and others made after a class-developed pattern. Some can mix hand-tool and machine processes. There is opportunity as well as need for much greater variety in these one-boy, start-to-finish projects upon which we place reliance.

There should be some *small-group jobs or projects* at which three or four boys may work and talk together. These match certain spots in the work-world. They teach coöperativeness and make possible the development of both leadership and followership. The small-group projects or jobs teach something not to be expected from individual jobs alone.

Another learning device is *whole-class jobs or projects* which have their distinct contribution to make. The product can be got out for the boys, for their shop, for other departments, for the school or system, or for the whole community. The sizes and values of the things produced are not important; neither are the quantities and the sources of the funds to cover. There is a new learning or teaching opportunity, a new chance to picture the work-world. All boys may make all parts; each boy or group may make but one; the instructor may take a class as his helpers on whatever work is entailed; several classes may have their hands, heads, and hearts in such an undertaking. Here is the chance to show duplication of parts, the use of jigs, mass preparation, rapid assembly, new methods of finishing, and the like. If the work progresses ever so slowly, with the instructor telling and showing, there is sure to be great gain in ideas for the boys. How else and where else can they get these notions of coöperative endeavor, mass production, economy of time and materials, how work is really done, how the requirements of occupation are changing? The writer has often thought that such controlled whole-class projects and jobs, assuming much explanation by the instructor, have more teaching worth than what we know as "production." At least in industrial arts, we do not need real production method and salable product in order to afford a new learning experience. Production ways and means are vital industrial-arts content and they must not be denied because of contracts for finished goods seem impossible or illogical. Any teacher knows enough and has equipment good enough to present the elements of present-day, wholesale manufacture.

Finally, we cannot ignore the *teacher's projects and jobs*, of which there should always be at least one advancing. By this means a good teacher quietly and surely establishes his right to confidence and respect; he shows his margin of skill and information as do the teachers of academic subjects with whom the same boys are associated. He can, through this means, exhibit some special techniques and some methods of planning which boy-level projects exclude from his course. Well selected and occasionally discussed, such projects and jobs will build appreciation of craftsmanship so much needed today. They will show the connection between related, yet distinct occupations, such as those of the draftsman, the patternmaker, the foundry man, and the machinist. They will depict the work of the cabinet-maker, the man who constructs concrete forms, the furniture maker, and the millman. Where else and how else is a boy on brief units to learn of these connections and these employments so clear to his teacher?

If we are to continue to substantiate our claims for the industrial subjects as necessary parts of a general education and as having both guidance and training values, we must be certain of these things: The courses offered must broadly explain industry; the content of the courses must be a fair sampling of the skills and knowledges of the crafts selected; the teaching methods must be as varied as the difficulties of students and of subject phases; the manipulative work assigned must picture the life of the mechanical workman.

There must be variety at every turn — variety in the fields of work represented, variety in the units of in-

struction, variety in the methods of presentation, *variety in the physical product of the shops*. The working world, particularly that part of it known as mechanical industry, is an active, changing world. We have accepted the responsibility of portraying it to youth and we can't do it by static means. Precedent and formality will hinder us as we attempt the industrial education of our people. Let's not have all boys doing the same thing. Let's not have succeeding classes repeat the timeworn tasks. Let's make different things, new things, things in great variety. Let's keep our shopwork smacking of change and crispness. Let's show our boys what the new world is and what men are doing in it. Good industrial arts means a broad, varied sampling of what industrial workmen do and know.

# Cutting School-Shop Expenses[1]

## Arthur Hansen

*General-Shop Instructor,*
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*Cutting costs is a necessity in the school shop. The author of this article succeeded in doing it, although not every teacher will agree with his method.*

DUE to present economic and financial conditions many changes must be made in our methods of handling and teaching shop classes. Advantage must be taken of every opportunity to give the best instruction possible in spite of diminished budgets.

Small shops feel the pressure of economy perhaps more than the large ones and some of the small ones are faced with the possibility of being closed unless a method of meeting expenses can be found.

Since the chief purpose of the shop teacher in the agricultural school is to teach the students how to handle tools and to make repairs of all kinds, he should welcome the opportunity for his pupils to gain experience through making actual repairs. Some may ask, "Should the school shop become a repair shop?" The answer is that our shop did repair jobs and the plan worked quite well. Perhaps it would not work quite so well in all communities, but with due consideration any small school can work out a similar plan.

Last year we were faced with the possibility of having a great many projects on hand at the end of the year, the material for which had not been paid for. It was therefore necessary to devise other methods of supplying jobs, or produce projects that could be sold. This year we faced a similar situation. An investigation was made and the school board was found to have several jobs which they desired to have finished. The jobs were undertaken by the manual-arts classes and handled so successfully that persons outside of school asked if we would make things or do jobs for them. Some of these jobs include such a variety of work that they were accepted and made part of our shop instruction.

Briefly the plan was to secure as many jobs as possible from the community at the beginning of the year. This was done so that a variety of jobs might be selected and organized under the various phases of the general shop. The size and equipment of the shop had to be considered, of course, and jobs that were too large were not attempted. After the jobs involving elementary principles had been completed the class was organized into groups to fit the jobs chosen. These groups consisted of two or more pupils according to the size of the job. Each group worked under a foreman or leader who thoroughly studied the job and supervised the working crew. The foreman's job is an important one and was assigned only to advanced students. This gave the boy a chance to use his experience while acting as a leader and guide, and the shop instructor was left free to give individual help wherever needed.

### Difficulties Encountered

The following difficulties were encountered and the same may be met in other communities:

1. The jobs cannot always be organized into units corresponding to those of the general shop, most of them being in the woodworking field, thus leaving out sheet-metal and electrical work.

2. Some workmen in the town itself object to having work done in school shops.

3. Classes may be too small. It is not advisable to attempt the plan with a class of less than twenty. With a small number the work drags and the boys lose interest.

In conclusion it may be said that there is no better way of selling the shop to the public than by doing jobs which represent actual needed work. They should not be undertaken with a view to making a profit but merely to cover expenses.

### List of Jobs

1. Making a two-wheel trailer.
2. Painting concrete walls.
3. Making a bookrack.
4. Making benches.
5. Making trellises.
6. Installing electric switches.
7. Mending a concrete wall.
8. Making tin tops for chimneys.
9. Repairing and replacing window sash and glass.
10. Turning table-lamp standards.
11. Putting Celotex on walls and ceilings.

[1]Delivered before the Manual Arts and Industrial Education Section of the Michigan Education Association, Lansing, October 21, 1932.

# CABINETMAKING
## FOR THE JUNIOR HIGH SCHOOL

### BENCHWORK

| TRADE PRINCIPLES | SUGGESTIVE JOBS | TRADE DRAWING | TECHNICAL MATHEMATICS | SCIENCE | TRADE TERMS | AUXILIARY INFORMATION | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | HYGIENE AND SAFETY | VOCATIONAL GUIDANCE | MATERIALS AND EQUIPMENT |
| 1. Planing<br>2. Measuring<br>3. Sawing<br>4. Squaring<br>5. Gauging<br>I | Rectangular block<br>Cutting board<br>Keyboard | Sketching and freehand drawing<br>Lettering | Value of products<br>Practices:<br>A. Addition<br>B. Subtraction | Study of wood<br>Sources; varieties<br>Result of sawing close to vise | Length, width, thickness, face, gauge, gauging, sawing, squaring, working, warp | Ventilation<br>First aid | Cabinetmaking as a trade | Wood, rule, pencil, plane, gauge, hatchet, try-square |
| 1. Butt joint<br>2. Boring<br>3. Assembling<br>4. Fastening<br>II | Box<br>Whiskbroom holder<br>Mail box<br>Match holder | Freehand drawing<br>Drawing conventions<br>Sketching<br>Lettering | Bill of material<br>Practices:<br>A. Division<br>B. Multiplication | Close grained wood<br>Open grained wood<br>Effect of oxirol on bit | Stock, nailing, setting, boring, hammering | Dangers from:<br>A. Protruding nails<br>B. Oily waste | Opportunities for advancement | Screw driver, brace, bits, nails, screws, drills, hammer |
| 1. Gluing<br>2. Doweling<br>3. Clamping<br>4. Gouging<br>III | Drawing board<br>Bread board<br>Book holder<br>Pencil tray | Draw three views of one of these projects.<br>Theory of projection | Decimals<br>Board measure | Hot glue: Importance<br>Good contact<br>Good pressure | Jointing, gluing, facing, glue heating, clamping<br>Doweling | Dangers from:<br>A. Infection<br>1. Eye<br>2. Blood poison | Hygienic conditions | Glue, brush, hand screws, clamps, gouge, bevel, bit, gauge, chisels |
| 1. Cross-lap joint<br>2. Sawing<br>3. Chiseling<br>4. Chamfering<br>5. Fitting<br>IV | Taboret<br>Creamery<br>Footstool<br>Necktie rack<br>T square | Lettering--Correct Dimensioning. Make a mechanical drawing of a project. | Quick method of finding centers<br>Decimals | Relative strength of the housed joint<br>Gluing screws<br>Reason for shape of screw points | Chiseling, fitting, chamfering<br>Fluting | Ventilation<br>First aid<br>Dangers from:<br>A. Infection<br>1. Eye<br>2. Blood poison | Apprenticeship and educational qualifications | Framing square, flat-head screws, round-head screws |
| 1. Turn sawing<br>2. Using spokeshave<br>3. Beading<br>4. Fitting hinges<br>5. Miter joint<br>V | Book holders<br>Bracket shelves<br>Medicine cabinets<br>Wall cabinets | Draw required views and details | Degrees in miter joint<br>Degrees in a circle<br>Degrees in a right angle<br>Degrees in a straight angle | Purpose of setting teeth<br>Testing bevel for correctness of 90 deg. | Spokeshaving, beading, mitering, beveling<br>Splines | Cuts from burrs<br>Burns from hot saw | Steady work or otherwise | Turning saw, spokeshave, compass, coping saw |
| 1. Mortise and tenon<br>2. Fitting<br>3. Fluting tenons<br>4. Beating tops<br>5. Scraping<br>VI | Taboretc<br>Tables<br>Piano bench<br>Umbrella stands | Mechanical drawing of joints and applications | Bill of material<br>Board measure | Contrast steel in the scraper and the burnisher | Pin, mortise, tenon, boring, angle brace, quarter sawing | Ventilation<br>First aid | Importance of trade | Scraper, countersink, quarter-sawed oak, dividers |
| Drawer Construction--<br>A. Butt; B. Gained;<br>C. Dovetail<br>1. Layout<br>2. Paneling<br>3. Drawer slide<br>4. Fitting locks<br>VII | Desks<br>Buffets<br>Tables | Joints and applications | Bill of material<br>Board measure | The direction of greatest expansion and contraction is widthwise | Butt, gained, dovetail, slide, taper, panel, rail, groove | Dangers from:<br>A. Infection<br>1. Eye<br>2. Blood poison | Welfare work | Locks, keyhole saw |

### MACHINE WORK

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Band Saw<br>1. Adjusting<br>2. Filing<br>3. Sharpening<br>4. Lubricating<br>I | Circular work<br>Irregular work | Geometrical problems<br>For layout work | Speeds and ratios of belts, pulleys, and cogs | Principles of friction in driving saw | Re-sawing, guides, lining, lubrication, safety switch, speed, feed, throat | Belt guards<br>Loose clothing | Visit to a cabinet shop | Saws, files, brazing outfit |
| Table Saw<br>1. Adjustment<br>2. Sharpening<br>3. Lubrication<br>II | Any suitable project | Angular settings<br>Shape of saw teeth | Speeds and ratios of belts, pulleys, and cogs | Difference in shape of teeth<br>The reason for setting teeth of saw | Rip, crescent, circular, saw table, fence, rabbeting, saw guard, push-stick | Warning: Keep your fingers away | Machine work<br>Bench work | Saws, dado head, wrench |
| Jointer<br>1. Adjustment<br>A. Knives<br>B. Table<br>C. Fence.<br>2. Sharpening<br>3. Lubrication<br>III | Surfacing<br>Jointing<br>Tapering<br>Beveling | Machine details of the jointer | Speeds and ratios of belts, pulleys, and cogs | The reason why we have water run on grinder | Surfacing, tapering, whetting, straightedge, knife guard | Proper adjustment of guards | Effect of labor-saving devices on trade | Knives, wrench, lubricant |
| Surfacer<br>1. Adjustment<br>2. Sharpening<br>3. Lubrication<br>IV | Planing<br>Beveling<br>Tapering | Machine details of surfacer | Speeds and ratios of belts, pulleys, and cogs | Sectional feed roll gives a more powerful feed | Surfacer, cutters, feed rolls, chip breaker | Enclosed moving parts | Hours, wages | Cutters, feed roll, lubricant |
| Mortising Tenoner<br>1. Adjustment<br>2. Lubrication<br>V | Furniture projects:<br>Tables<br>Desks | Machine details showing shape of mortiser chisel | Review:<br>A. Fractions<br>B. Decimals | Shape of mortiser chisel to throw chips into bit spirals | Boring machine stops, blower, cone pulley | Avoid talking, to decrease the number of accidents | Efficiency factors | Chisels, bits |
| Lathe<br>1. Adjustment<br>2. Lubrication<br>VI | Projects involving:<br>A. Chuck work<br>B. Faceplate work<br>C. Spindle work | Design of cone pulley | Review:<br>A. Fractions<br>B. Decimals | Shearing and cutting cuts<br>Principles of holding tools on T-rest | Toolrest, spindle, skew chisel, gouge, parting tool, faceplate, chuck | Shifting belts | Union shop vs. closed or open | T-rest, chuck, wood-turning tools, blower |
| Sander<br>1. Adjustment<br>2. Renewing abrasives<br>3. Lubrication<br>VII | Any suitable project | Machine details of sander | Review: Board measure | Reasons why abrasive paper is greater near the rim of disk | Disk, spindle, drum, abrasive | Keep your hands away from drum | Advantages of having a trade | Extra disk, sandpaper |
| Trimmer<br>1. Adjustment<br>2. Lubrication<br>VIII | Suitable projects | Machine details of trimmer | Ratio<br>Percentage | Reason for taking a thin chip | Angle block, trimmer | Danger: Beware of knives | "Slightofitemness" | Knives, angle block |
| Grinder<br>1. Adjustment<br>2. Dressing<br>3. Lubrication<br>IX | All edge tools | Drawing of spindle to show proper way to fasten wheels | Review I: Speeds and ratios of belts, pulleys, and cogs | Study and discuss why the tool should be dipped in water | Tool carriage, wheel faces | Protect your eyes | Visit to a cabinet shop | Spindle, tool carriage |

### FINISHING

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. Staining<br>2. Filling<br>3. Shellacking<br>4. Varnishing<br>5. Rubbing<br>6. Rubbing rottenstone<br>7. Polishing<br>8. Alcoholing<br>9. Waxing<br>10. Fuming<br>I | Suitable projects | Review of: Mechanical-drawing conventions and details | Figure cost of these projects, and material. Market value of these projects. | Simple formula for stains, wax, etc.<br>Discuss: Does finishing preserve wood? | Pigment, varnish, flat color, orange and white shellac, rubbed finish, stain, high lights | The care of combustible material | Visit to a furniture shop | Scraper, sandpaper, brushes, stain, filler, alcohol, linseed oil, varnish, shellac |
| 1. Painting<br>A. Mixing<br>B. Applying<br>2. Enameling<br>A. Priming<br>B. Applying<br>II | Medicine cabinets<br>Towel rollers<br>Bird houses<br>Tool boxes | Review of: Lettering | Cost of paints and enamels | Study and use of filler<br>Purpose of priming coat | Enamel, oil, boiled oil, turpentine, drier, flat effect, priming, thinner | Safe ladders and staging | Hours, wages; discussion of painting trade | Putty, dryer, turpentine, enamel |
| 1. Upholstering<br>A. Plain<br>B. Tuft<br>C. Over-stuffed<br>III | Chairs<br>Stools<br>Sewing tables<br>Misc.--Furniture | Review of: Discussion-ing; projection; geometrical problems | Compare cost of the different methods of upholstering | Process of tanning | Tuft, over-stuffed, webbing, rails | Breathing dust | Visit to an upholstering shop | Canvas, curled-hair, springs, leather, tapestry |
| 1. Caning<br>A. Framing<br>B. Boring<br>C. Weaving<br>D. Braiding<br>IV | Stools<br>Chairs<br>Wastebaskets | Taking practice | Figure cost of caning different pieces of furniture | Reason for odd number of holes<br>Reason for keeping cane wet | Panels, friezes, cupor fine, tying, stitch caps | The care of combustible material | Study of caning industry | Awl, knife, rule, dividers, wood, stitch-cane, water |
| 1. Splint work<br>A. Weaving<br>B. Finishing<br>C. Wrapping<br>V | Rush Seats<br>Baskets<br>Stools | Aid in drawings already completed | Cost of material | Necessity for varnishing and shellacking | Spoke, weaver, splint reed, wrapping, stuffing | Knife<br>Fire crumpus | Study of industry | Tacks, stuffing pliers, wood, splint reed |

*Cabinetmaking analysis, submitted by William H. Bowers, formerly at Edison Junior High School, Harrisburg, Pennsylvania*

# INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

## The Opening of School

On Wednesday, September sixth, a man, viewing the procession of straggling youngsters, solemnly plodding along on their first trip to the school after vacation, remarked to his wife: "Look at the kids — I bet they are sorry that vacation is over." His wife's reply was: "Yes, there are many sore hearts today."

This rather somber way of looking at the opening of school presents food for thought. True, vacation time with its freedom of action for the pupils, the almost total absence of all guidance and direction, must be very sweet to the average youngster. When he is starting back to school, then, he may be granted the privilege of shedding a few saline tears for the freedom which he is giving up, but beyond this the average student should, and most likely does, feel, if not happy, at least satisfied, that the school year with its strictly regulated program is again demanding his attention.

If this is not true with the majority of pupils in any given class or subject, the fault must be placed squarely on the shoulders of the teacher. If the school's business is to prepare the student for life, it must teach him to find real happiness in whatever duty demands of him. Our Declaration of Independence mentions the pursuit of happiness as one of the inalienable rights of man; and the teacher, in whose hands the training of young America has been placed, must bear in mind that he must consciously train the child to know what true happiness is, and how he may attain it even when confronted by conditions that in themselves may be far from cheering. The present era of suicides is evidence of a training which did not fit certain people for life. Conditions today are a phase of life to which humanity must adjust itself. They must be met with honesty, courage, patience, and fortitude. These suicides lacked one or more of these virtues. Somewhere their training was defective; somewhere their education was faulty; somewhere there were teachers who failed in their duties.

It is especially necessary at the present time that the teacher be the dispenser of good cheer and happiness to the students who attend his classes. There are so many of the youngsters of school age who under the present conditions find little or no cheer at home. Stark necessity is stalking the footsteps of everyone in the household. Food is scarce, rent in arrears, and there is no money for buying needed shoes and clothing. True, social agencies have done almost the impossible to see that no one is suffering for want of actual necessities, and yet "actual necessities" is a term that covers very little. If then, these waifs from the poverty-stricken home of the jobless enter the school with a precociousness engendered by facing the naked realities of life; if they come into the classroom covered with rags and filth — the sure sign that beings once civilized are reverting to barbarism — they stand sorely in need of the good offices of a real teacher. It must not be forgotten that these children will be the workers of the next generation and their characters must be formed now during their school days if they are not to become the cynical communists of the near future.

Teachers have always shouldered grave responsibilities, but these times have added materially to their burdens. It is well for them to remember this, and the opening of school offers an especially fine opportunity for them to give a little thought to this added burden which the exigencies of the times impose.

## Your Magazine

Have subscription prices to magazines been reduced during the present economic upheaval in the same proportion as the costs of other commodities have been reduced, and if they have not, why haven't they? This question has come up in the minds of many of the readers of our national magazines, and some of the subscribers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION have asked for an explanation why the price of this Magazine has not come down. One of our readers stated the question in this way: "Teachers' salaries have been reduced; why has not the price of your magazine been lowered?"

Probably few subscribers to American magazines ever give a thought to the fact that the subscription price which they pay does not cover the cost of producing their magazine. Few of us have ever considered what part of the publishing costs of *Collier's* or of the *Saturday Evening Post* is covered by the five cents which we pay for it. There are few who know that if it were not for the advertising income which makes the publication of American magazines possible, all subscription prices would have to be raised materially.

Furnishing a magazine to the subscriber is not just a simple proposition between a publisher and a reader. It is rather a coöperative venture between the publisher, the subscriber, and the advertiser. Take away any one of these three groups and the magazine can no longer exist.

During the past two or three years, school and teacher incomes have gradually decreased. When the school and the teacher ceased buying as was their wont, many advertisers concluded that there was no need to keep their wares before the eyes of their prospective buyers. Seemingly they forgot that a market once attained could be very quickly lost. Acting under the lash of frantically instituted economy drives, some of these erstwhile advertisers sacrificed the opportunity for probable sales to the small but definite savings made by curtailing or even ceasing all advertising.

This then brought the problem squarely up to the publisher. In order to furnish the reader with a magazine at all, production costs had to be reduced as much as possible. And even then in order to fulfill an obligation into which both publisher and reader had entered in good faith, the publisher at considerable loss to himself had to continue furnishing the paper. Reason-

able readers will readily see that under these conditions it was impossible to reduce subscription prices if the standards of the Magazine were at all to be upheld. Speaking for INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, the editor calls the reader's attention to the following facts:

The high goal set for this periodical has been maintained throughout the depression. Timely material written by experts in the fields of industrial-arts and vocational education has appeared from month to month. By practicing the utmost care in presenting illustrations and printed matter in the smallest space conforming with legibility, as much material as possible has been presented to the reader. In no instance has any standard been sacrificed.

It may come as a surprise to many readers that the 1933 issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION that have so far appeared, contained 288 pages of editorial matter. Each of these printed pages had a type body measuring approximately 6¾ by 10 inches. For this sizeable amount of printed material the subscriber paid the usual $2.50. It is not uncommon that a reader pays from $2.50 to $3.50 for books on industrial-arts and vocational-education work which contain less than 400 pages, with a type body per page measuring approximately 3¾ by 5¾ inches. Comparing area for area of printed matter, the material that has appeared so far this year in the Magazine would be equivalent to a book of 900 pages of the average size. Besides all of this editorial material, the subscriber was given 20 tracing supplements for use in his class.

From the foregoing, the thoughtful reader will readily conclude that the publisher, too, has taken his cut, and that in fulfilling his obligation to his readers he has suffered a more severe reduction, in many instances, than even the schools and the teachers have had to take. It is needless to say that just as soon as conditions permit, the editorial offering to the readers will again be increased, but in the meantime, the publishers will do nothing that may in any way jeopardize or endanger the achieving of the high standards which have been set for INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

## A Worth-While Experiment

An experiment is to be tried out in the building of the Cove Creek Dam in the Tennessee Mountains. The project will be undertaken under the supervision of the Tennessee Valley Authority, of which Arthur E. Morgan, president of Antioch College, is chairman. The labor will be recruited from the surrounding region, and the men will put in a thirty-hour working week on the dam, the remainder of the normal working day to be given over to "manual training in the trades with which they are unfamiliar or to other work of an educational nature."

It has been estimated that the working out of this experiment will materially increase the length of time required to construct the dam, but this need not cause any great misgivings. Under present conditions, no doubt much of the labor secured from the immediate neighborhood in which the dam is to be erected, belongs to the unemployed class. Employing them thirty hours a week comes pretty close to the N.R.A. standard, and giving them vocational training in addition, can only be productive of great good. Many of these adults, no doubt, for the first time in their lives, will have an opportunity to acquire worth-while vocational training that will lift them out of the class of unskilled labor. The experiment, therefore, is to be highly recommended.

If, in the next year or two, conditions should improve so rapidly that the power to be derived from the dam will be greatly needed, the fact that the trying out of the experiment has delayed the completion of a job, can be quickly corrected by turning the entire job back to the army engineers or to the Bureau of Reclammation who originally were to do the work.

It is true, the gaining of additional power may under certain circumstances be a great benefit, but the lifting of any group of Americans from the rank of unskilled labor to that of the semi- or skilled laborer, is worth much more.

The members of the Tennessee Valley Authority, therefore, are to be complimented on their foresight, and it is to be hoped that success will attend their experiment in both the fields of hydroelectrical, as well as of human, engineering.

## Knowing The Student

Dr. Milton C. Potter, superintendent of the Milwaukee public-school system, in his first bulletin to his teachers this year, humorously refers to the "Colonial mandate to pedagogues: 'Learn them children.'" Ungrammatical as this statement may sound, it nevertheless contains a great deal of good advice. Before the teacher can teach his students properly, he must know them thoroughly. They form the subject matter which he must learn. Each student is a separate entity, and the teacher who does not know his students, no matter how well he may know his subject, will not be achieving all that is possible for him to achieve.

Many a wayward boy has been won over by a sympathetic teacher who had gone to the trouble of actually studying his make-up. This diagnostic probing into the boy's personality must be done carefully.

The boy may and usually does feel that there is nothing wrong with himself. The rest of the world may be out of step, but he is all right. To bluntly tell such a boy, at the very outset, what is wrong with him, would merely be aligning oneself with those whom he looks upon as enemies. In other words, the boy would at once be aroused to antagonism.

With patience, diplomacy, and a real desire to reach and help the boy, the right kind of teacher can win the confidence of such a student, and thereby place the entering wedge for future opportunities of developing the boy's character in the right direction. The teacher's job, then, is more than merely teaching a subject. If he fails to influence the character of his pupils, he is a failure, even though he be an expert at initiating the beginner in the intricacies of the most difficult subject.

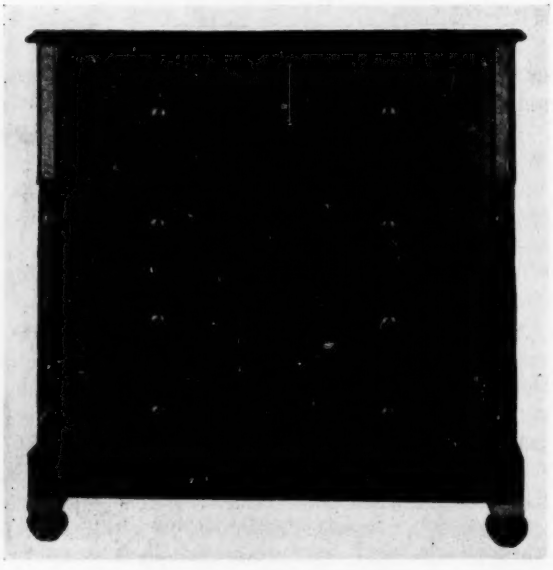
# Problems and Projects

## CHEST OF DRAWERS

**Harry F. Mergler, High School, Chillicothe, Ohio**

(See Supplement No. 275)

A chest of drawers is a useful, conservative, and dignified piece of furniture. This project will appeal to the advanced student, since it embodies turning, cabinetmaking, and finishing. The chest proper is made of walnut throughout, except that plywood panels are used for the back and ends, and all drawer bottoms are made of plywood. Burl veneer (four-piece match) is used on the drawer fronts, and a maple inlay is used on the post projections and on the legs. All frame mortises are ½ in. Drawer slides and guides prevent the tipping and twisting of the large drawers.



Two drawer rollers are used on each slide to insure free-working drawers. Drawers are half-blind dovetail on the front and rabbet construction on the back.

Split turnings are used on the front of the post. The legs or feet are doweled into the post. The top stretcher is dovetailed to insure rigidity in construction. Plywood is fastened to the bottom of lower drawer slides and to the front and back bottom stretchers to prevent dust from sifting up through the drawers.

The chest throughout calls for accuracy, but the results will amply repay the careful worker.

## FREE-HAND, THIRD-ANGLE PROJECTION FOR BEGINNERS IN MECHANICAL DRAWING

**Jonathan Bright, Academy High School, Erie, Pennsylvania**

(Continued from June, 1933, See Supplement No. 276)

*Problem Sheet No. 15*

Sectioning. The first three problems are similar to the problems on Sheet No. 9, except that dimensions have been added. Two of the problems introduce conventional sections where a rib is cut by the plane of section but the section is drawn as if the section plane passed in front of the rib. One problem is to be a conventional section of an object having three lugs. If a true section is drawn of this piece the sectional view is lopsided, but if the section is drawn with the cutting plane passing through two of the lugs then the section is more symmetrical and understandable. The next problem introduces sectioning of wood and the last a detail section where more than one section is required to show a changing shape.

*Problem Sheet No. 16*

Screw threads and rivets. The first three problems introduce the proper representation of male threads. They may be drawn by any method the instructor desires. The first was intended to represent the simplest conventional method, the second the conventional method of drawing a small square thread, and the third a large U.S.S. thread drawn as a V thread with a notation stating that it is a U.S.S. thread. The next three problems are intended to be drawn with or without sectional views showing two methods of representing a U.S.S. thread and one pipe thread. The last two problems teach sectioning where a rivet, bolt, shaft, etc., are in the section plane but are not sectioned.

The foregoing sixteen sheets of problems introduce many of the fundamentals to be taught in a course of mechanical drawing. With the addition of problems in assembling the details of a machine into an assembly drawing and the drawing of details from a carefully dimensioned assembly drawing the student will have been taught the essentials. He will, of course, need much practice in the use of the above principles and much additional study before he can be considered a finished draftsman. Most of these assemblies and details were taken from Faber's *Mechanical Drawing Problems*.[2]

[2]The Bruce Publishing Co., Milwaukee, Wis.

## THE ELECTRIC SOLDERING COPPER

**J. H. McCloskey, Director of Industrial Arts, Lakewood, Ohio, and F. A. Carlsen, Sherrard Intermediate School, Detroit, Michigan**

The electric soldering copper, shown herewith, has proved very satisfactory for the eighth-grade boys of the general-metal shops in the Lakewood public schools. It gives the boy a wide range of manipulative experience and forms a basis for an interesting study of electricity. This electric copper is simple enough for a junior-high-school boy to make successfully.

*Materials Needed*

See figure details and assembly.

*Tools and Equipment Needed*

Vise; hack saw; try square; machinist's ruler; emery wheel; file; ¼-in. pipe die; ¼-in. pipe tap; ⅜-in. U.S.S. die; ⅜-in. U.S.S. tap; 8–32 tap; center punch; hand or electric drill; 3/16-, 5/16-, and 9/16-in. drills; No. 28 drill; pliers; screw driver; pipe wrench; knife; and emery cloth.

*Procedure*

1. A piece of ⅜ by 8-in. copper will be required for the soldering bit. Make a neat point on one end. This may be done in a milling machine, shaper, or a grinder. On the opposite end cut a ⅜-in. U.S.S. thread.

2. Detail No. 2 is made of a piece of ¼-in. black iron pipe 6½ in. long. Square both ends. Cut a ¼-in. pipe thread 1⅞ in. long on one end. Tap the threaded end ½ in. deep with a ⅜-in. U.S.S. tap. Measure 1 in. from the threaded end, center-punch, and drill through both sides with a ¼-in. drill. Now working from the opposite end, center-punch, drill, and tap the hole as shown. The next operation will be to cut out the slot. This is done by using a hack saw and file, or it may be done on the milling machine if the shop has one.

3. Make the handle as shown in detail 3. This may be turned in the woodshop and the ferrule may be made by the

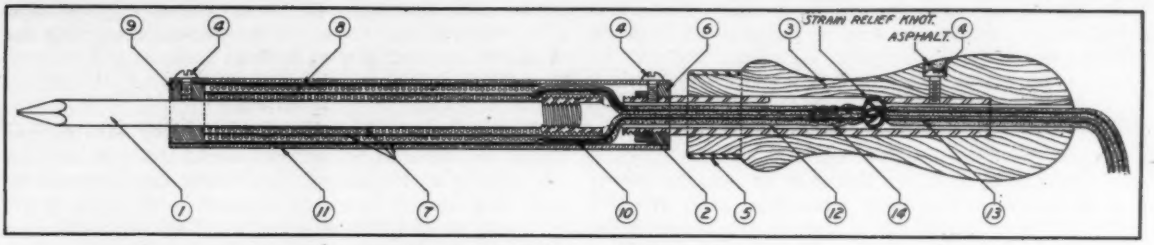



*Fig. 1. Assembly of soldering copper*

boy making the soldering copper out of a piece of 1¼-in. iron or brass tubing, as shown in detail 5. After the ferrule has been fitted, the handle is ready to be drilled. Use a 9/16-in. drill to drill a hole 4¼ in. deep from the ferrule end. Then drill the 5/16-in. hole through from the opposite end. Then lay off 3⅜ in. from the ferruled end, and drill and countersink the hole for the holding screw, as shown.

4. For detail 6, a piece of brass tubing, 1 by 7¼ in. long, squared at both ends, is required. Lay ¼ in. from each end, center-punch, and drill through one side with a 3/16-in. drill.

5. Detail 7 shows a Grabler coupling. A ¼-in. Grabler coupling is 1 in. long and the outside diameter is ⅞ in. so it fits into a piece of 1-in., 16-gauge brass tubing. Saw the coupling into two pieces. It is advisable to run a ¼-in. pipe tap through to clean out the thread. When this is done, center-punch, drill with a No. 28 drill, and then tap with an 8–32 tap for the machine screw.

6. The iron bushing, shown in detail 10, may be made by turning a piece of mild steel about 4 in. long to a ⅞-in. diameter. Chuck the turned piece in a universal chuck and drill it with a ⅜-in. drill. Then several bushings may be made by sawing off ½-in. lengths. Drill and tap for the set-screw as you did with part 7. The other half of the Grabler coupling also may be used in place of the iron bushing if a lathe is not available. Part 7 may be made in the same manner as part 10 if the instructor wishes to have the boys do the lathe work.

7. Next, cut two pieces of No. 30 iron wire, each 32 in. long. By folding over and twisting make each piece a 4-stranded wire 8 in. long. Thread this stranded wire through a piece of asbestos sleeving 5 in. long.

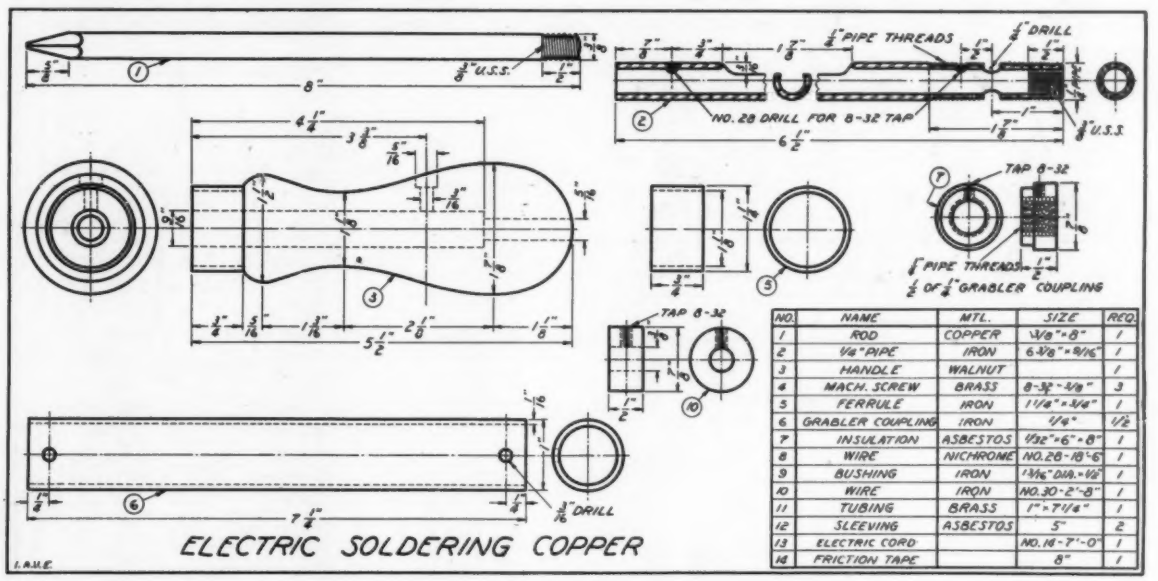
8. Assemble parts 1, 2, and 7.

9. Thread in the two iron wires which have been covered with asbestos sleeving in step 7.

10. For the element, No. 28 nichrome wire is used. This has about 4.7 ohms resistance per foot. With 18½ ft. of this wire used in the heating element of the soldering copper, 1.26 amperes will be drawn on a 110-volt line. Cut off the right length of nichrome wire, and wind it upon the brass tube. This will make it convenient for handling when winding the copper. Then cut a piece of sheet asbestos, 2 by 6 in., wet it and then wrap it around the copper, starting at the 5/16-in. hole. Then carefully connect the nichrome wire to one piece of the iron wire and proceed to wind. Make the turns about 1/16 in. apart. When the wire is wound to the end of the asbestos, cut another piece of sheet asbestos, this sheet being 3 by 6 in. When this sheet is on, covering all of the first layer of wire, continue to wind back toward the handle. Connect the end of the nichrome wire to the second piece of iron wire. Wet another sheet of asbestos and cover. Put the brass casing over and fasten with a 3/8-in. machine screw. The asbestos must be allowed to dry perfectly before the copper is tried out.

11. The extension cord is next attached. This also should be of the asbestos-covered variety. Thread it through the ¼-in. pipe, pulling it out at the slot. Then tie a strain relief knot and make the connection. With a piece of ⅜ by 8-in. tape cover the joints carefully and force the wire back into the pipe. Then slip the handle on, fasten with a ⅜-in. machine screw and connect the split plug.

12. Fill the countersunk hole in the wood handle with asphalted wax. Paint the handle and polish the brass tubing.




| NO. | NAME | MTL. | SIZE | REQ. |
|---|---|---|---|---|
| 1 | ROD | COPPER | 5/32"-8" | 1 |
| 2 | 1/8" PIPE | IRON | 6 3/8"-9/16" | 1 |
| 3 | HANDLE | WALNUT | | 1 |
| 4 | MACH. SCREW | BRASS | 8-32"-3/8" | 3 |
| 5 | FERRULE | IRON | 1 1/8"-3/8" | 1 |
| 6 | GRABLER COUPLING | IRON | 1/4" | 1/2 |
| 7 | INSULATION | ASBESTOS | 1/32"-6"-8" | 1 |
| 8 | WIRE | NICHROME | NO.28-18'-6" | 1 |
| 9 | BUSHING | IRON | 13/16" DIA.-1/2" | 1 |
| 10 | WIRE | IRON | NO.30-2"-8" | 1 |
| 11 | TUBING | BRASS | 1"-7 1/4" | 1 |
| 12 | SLEEVING | ASBESTOS | 5" | 2 |
| 13 | ELECTRIC CORD | | NO.18-7'-0" | 1 |
| 14 | FRICTION TAPE | | 8" | 1 |

*Fig. 2. Details of soldering copper*

The copper is now ready for use. Insert the split plug into a wall socket and tin the point in preparation for future soldering operations.

## HALF-ROUND END TABLE

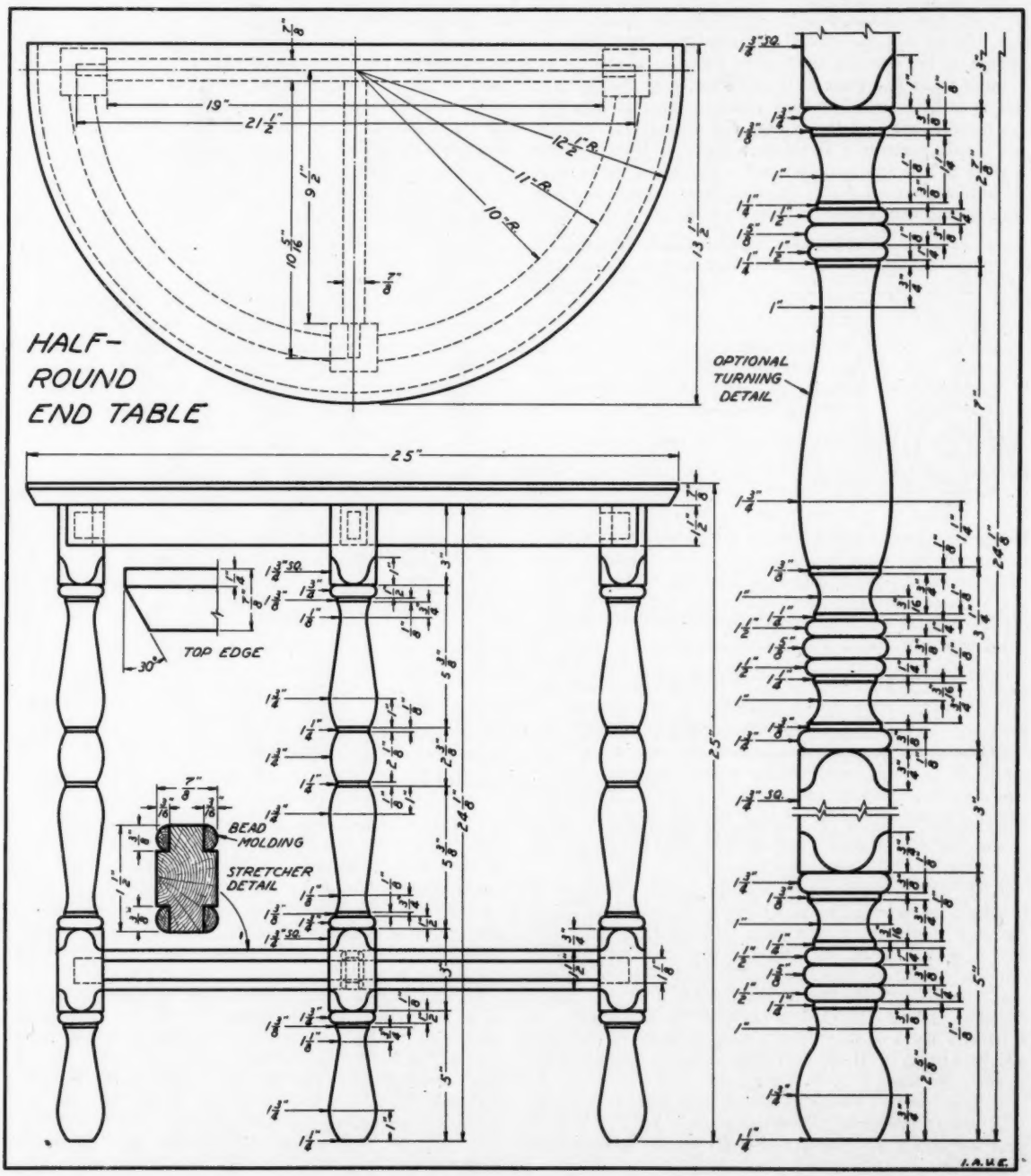
**Richard Shaver, High School, Saranac Lake, New York**

The half-round end table is made with one side flat to fit against the arm of a chair, a davenport, or against a wall. It is designed with two styles of turned legs, either of which looks well, for the convenience of students of different degrees of skill on the lathe. The stretchers, top and bottom, make it easy to assemble and very rigid for a table of this style. The top offers a splendid opportunity for a nicely figured piece of panel and the bottom stretchers may be ornamented with bead molding if desired, as shown in the detail. If a shaper is part of the shop equipment, a more elaborate type of edge may be cut on the top, but the one shown can be easily cut on a band saw and finished by hand.

### Directions

*Legs.* Square up 3 pieces, 1¾ by 1¾ by 24⅛ in., and center for the lathe. Square lines around the sticks, locating the parts to be left square. Turn to size and match all the legs, then sand the turned parts smooth in the lathe. Where a 1¾-in. diameter is given, make it as large as possible even if it runs under the 1¾ in. desired. Locate and cut the mortises ⅜ by 1⅛ by 1¼ in. deep. Sand the square parts by hand, rounding the corners slightly.

*Stretchers.* Select and square up 2 pieces, ⅞ by 1½ by 21½ in. and two pieces ⅞ by 1½ by 10 5/16 in. Lay out



and cut tenons ⅜ by 1⅛ by 1¼ in. long on each end of the long pieces and one end of each short piece. Fit to corresponding mortises in the legs and check by clamping together. If the lower stretchers are to be decorated with bead molding, cut the rabbets and glue the molding in place. One short piece is attached to the middle of each long piece with two 2-in. No. 10 f.h. screws. Sand with fine sandpaper, rounding the edges slightly.

*Half-round end table*

*Rails.* In order to make a template for the curved rails, it will be best to draw a full-sized layout of half of the top, showing legs as squares, and draw in the rail between the legs. Both pieces may be laid out on a piece of stock 1½ in. thick, 5 in. wide, and 14½ in. long, and cut on the band saw. Leave them a little longer than necessary so that they can be exactly fitted later. Smooth up the front surface with plane and sandpaper.

*Top.* Select a well-grained panel 13/16 or ⅞ in. thick for the top and lay it out with a 12½-in. radius. Cut it to size and shape, 13½ by 25 in. and square up the edges. Then lay out a line with a marking gauge, ¼ in. down from the top surface, on the curved front edge, and with the table of the band saw set at 30 deg., saw the edge out very carefully. Smooth up with plane and sandpaper.

*Assembly.* First glue the stretchers, top and bottom, between the legs, testing to be sure that they are straight and square. On the underside of the top, locate the legs and top stretcher and attach it in place by screwing up through the stretchers into the top wherever necessary to hold it tight. Next, the curved rails are fitted in place between the legs and attached with glue and screws up into the top. Remove all surplus glue and smooth up with fine sandpaper. Finish with successive coats of oil stain, filler, shellac, and varnish in the usual manner. Chair glides may be driven into the bottom of the legs if desired.

## FIRST COURSE IN PATTERNMAKING

**Alexander V. Hanel, Boys' Technical High School, Milwaukee, Wisconsin**

### A Typical Individual Instruction Sheet
### Patternmaking I — Problem I

Patternmaking I requires the making of five patterns, a special cope, and one mold. Among the five patterns are a pawl, a bracket, a spout stand, and a simple cylindrical pattern which is turned in the lathe.

Shrinkage, draft, and finish should clearly be understood before venturing to make patterns. Refer to *Patternmaking Essentials*

The first problem is that of a pattern for a cast-iron pawl. The pawl was chosen because it is simple and yet involves the necessary machining, laying out, and tool processes. It is assumed, of course, that the student knows how to handle the marking gauge, chisel, and plane.

The pawl is a click or bar which falls into the teeth of a ratchet, and which prevents the ratchet from moving backward. Pawls are made in various designs, depending upon their function. *Name some mechanism which embodies a ratchet and pawl.*

Before a patternmaker starts the making of a pattern, he must first think of how the given pattern should be molded, and how it is to be made so that it has the required strength and durability. He should know in which direction the grain of the wood should run, and what shrink rule he is to use.

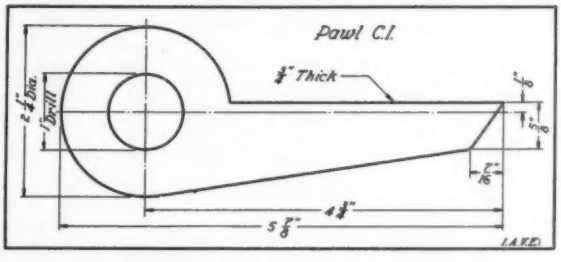
The drawing shows that a 1-in. hole is to be drilled in the center of the partial circle. This hole may be disregarded by the patternmaker because small bored and drilled holes are usually machined from the solid stock in the machine shop.

The pattern of the pawl is to be made of white pine. This wood is generally used for ordinary pattern work. When patterns are made of which many molds will be required, a more durable wood, such as mahogany or cherry, must be used. Metal patterns are used only for molds from which many castings are made on a productive scale.

The pine chosen should be clear and free from knots and other defects. For safe machine operation the stock should be at least 1¼ by 2½ by 13 in. The stock should be first surfaced on the jointer, on one surface and one edge. *What are these called?* The parallel thickness and width are made next. *Which machine makes the woodstock parallel in thickness? In width?*

Note: *A new student should never venture to use any machine until he has been given a demonstration by his instructor.*

Bear in mind that the patternmaker's most important job is to work accurately. The pattern would be worthless if it did not strictly conform to the drawing.




Use the shrink rule for all measurements. *Which shrink rule must be used for this pattern?*

*Procedure for Machining, Laying Out, and Tool Processes*

1. Use jointer to make working surfaces and working edge.
2. Use planer to produce parallel sides 1 in. thick.
3. Use circular ripsaw to make parallel edges. The piece is to be 2½ in. wide.
4. Plane by hand one surface true and smooth.
5. Plane by hand one edge true and smooth and square to surface.
6. Gauge for thickness. Set gauge from ⅛-in. shrink rule.
7. Band-saw within 1/16 in. of gauged line, and plane to thickness.
8. Gauge horizontal center line on both surfaces.
9. Draw vertical center line on both sides, using the knife, and the combination square.
10. Scribe partial circle with dividers, using intersection of horizontal and vertical centers, on both surfaces.
11. Lay off length, with knife point, from vertical center line. Complete the layout on both surfaces but omit the 1-in. drilled hole.

12. Trace layout with hard pencil, and get an O.K. from the instructor before final band-sawing of pattern. Allow about 1/16 in. for chiseling, and use the hand plane where possible.

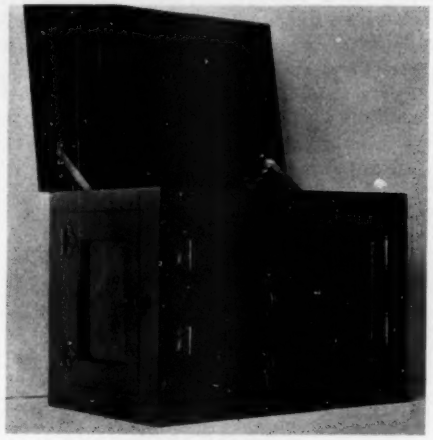
13. Sandpapering should be done with a 5/16 by 1 by 3½-in. smooth, sharp-edge block. A small block is recommended for small work.

## WOODWORK TEACHING DEVICE

**C. H. Christopherson, Township School, Wakefield, Michigan**

The accompanying photograph and drawing illustrate a woodwork teaching device that has been found very helpful. Every instructor knows that a demonstration, no matter how carefully planned and given, does not complete the teaching of a unit of work. A considerable amount of follow-up is usually necessary. The busy instructor, with a large class, cannot always find time to go through a demonstration or parts of a demonstration a second or third time for the benefit of those students who did not get the idea the first time it was presented. However, something must be done for this group of students, and the teaching device illustrated herewith solves the problem in many cases. To illustrate this point, we might have a student who is familiar with all the tool processes involved in the construction of a drawer, yet he might not know which processes to select and combine to make a satisfactory drawer. It would be a simple matter for the instructor to refer him to a completed drawer, such as the one illustrated in this teaching device, where he could see for himself just what is to be done. The same situation exists with many other types of woodwork constructions. What is true of woodwork constructions is equally true in the application of cabinet hardware.

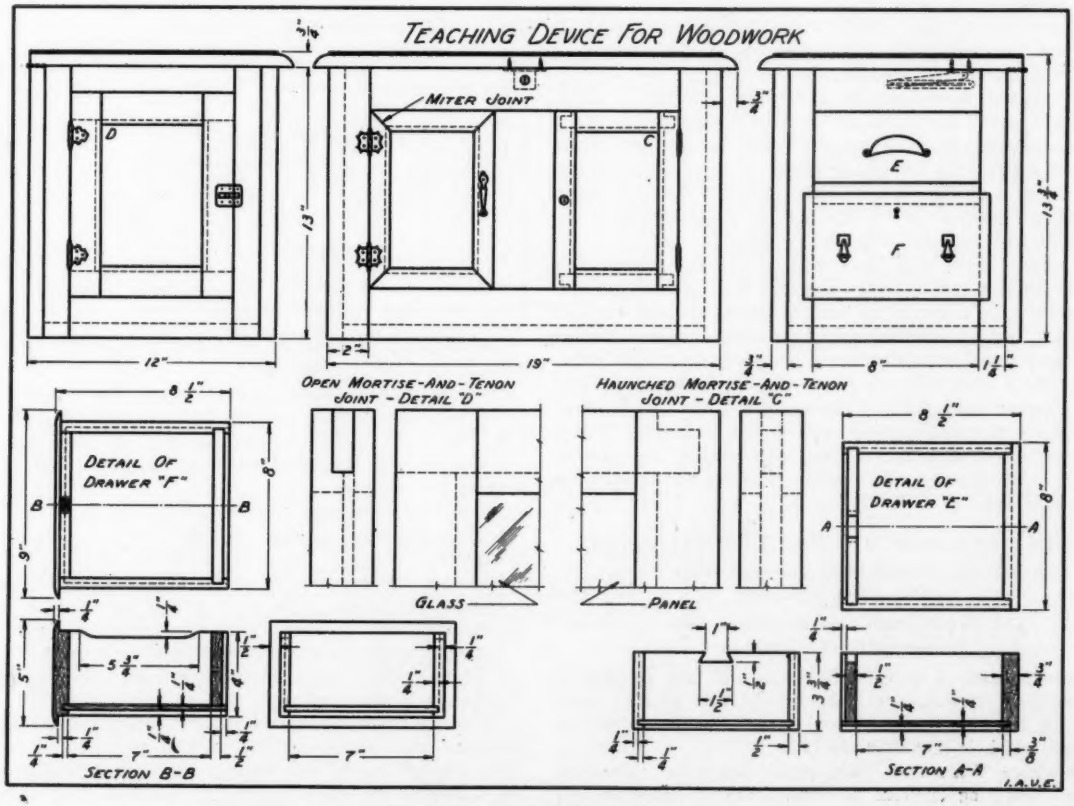
This teaching device combines many of the more typical woodwork constructions with the application of cabinet hardware. The device is small and compact, making it easy to move about, and convenient for storing in a small space. Red gum and white pine were used in the construction, except for the drawer bottoms which were fir plywood. The framework is put together with roundhead screws so that it can be taken apart readily and rebuilt to include additional features. The sizes given are only suggestive, yet to make it much larger



*Demonstration cabinet*

would complicate the storage problem, and to make it very much smaller would necessitate the use of special or miniature hardware. It is best to use nothing but standard-sized hardware items. A stain-and-varnish finish was applied to the outside to add to the general appearance.

Neither the photographs nor the drawing show all the construction details of the teaching device. To include everything would require too many detailed drawings. However, the lists




*Details of demonstration cabinet*

below indicate the various items of hardware and the different types of woodwork constructions employed.

**Hardware**

*Hinges*
- Butt
- Chest
- Surface
- Half-surface

*Locks and Catches*
- Cylinder chest lock
- Drawer lock
- Cupboard catch
- Friction catch
- Push-button spring door catch

*Miscellaneous Hardware*
- Chest-lid supports
- Metal shelf supports
- Brass drawer pulls
- Drop-handle drawer pulls
- Wood knob

**Woodwork Constructions**

*Door Construction*
- Flat panel with haunched mortise-and-tenon joint
- Raised panel with miter joint
- Glass with open mortise-and-tenon joint

*Drawer Construction*
- Flush front with rabbeted joint
- Overhang front

*Miscellaneous Constructions*
- Edge mold
- Flush, flat, and raised panels
- Butt, dado, groove, miter, open mortise-and-tenon, and haunched mortise-and-tenon joints
- Drawer guides
- Drawer rails

## SMALL FLOOD LIGHT

**B. D. Elliott, Allen C. Mason Intermediate School, Tacoma, Washington**

(Continued from page 297 of the September 1933 issue.)

Figure 10 shows how to make a slide for projecting a crescent-shaped moon on the back of a curtain. This requires a slide in which a crescent-shaped opening is flanged on all sides by strips of tin.

For better reflection, the inside surface of the flood-light body may be polished with a little denatured alcohol after the lamp has been completed. The whole may then be supported with ropes or on a wooden or steel tripod as will best suit the user.

## TABLE LAMP

**David C. Knight, Wenonah Military Academy, Wenonah, New Jersey**

**A Typical Job Sheet**

*The Feet — Parts A and B*

1. Cut a piece of band iron ⅛ by ¾ by 18 in.
2. Bend ends and drill as shown in Figure 1.
3. Cut 2 pieces of band iron ⅛ by ¾ by 6 in.
4. Bend one end of each piece and drill holes according to Figure 2.

*The Base — Part C*

1. Cut a piece of No. 24 gauge sheet iron 8¾ by 13 in.
2. Lay out an ellipse according to Figure 3.
3. Locate center lines from template and mark clearly.
4. Turn up and crimp the edge by the use of a block and ball-peen hammer. Ask the instructor for a demonstration.
5. Drill six 13/64-in. holes.
6. Rivet the feet A and B to the base C.
7. Lay out and drill the ½-in. hole and the ⅜-in. hole.
8. Tap the ½-in. hole with a ¼-in. pipe tap.

*The Standard or Handle — Part D*

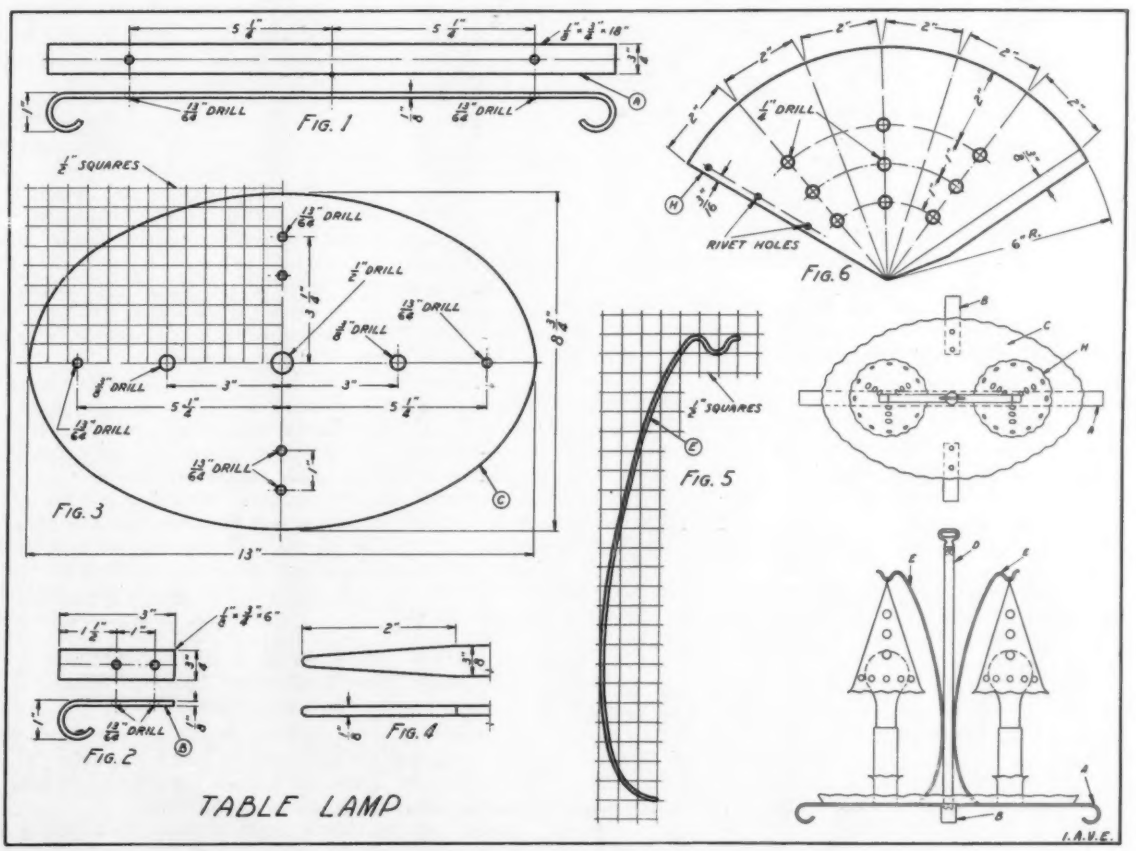
1. Cut a piece of ¼-in. pipe 13½ in. long.
2. Tap the inside of one end with a ⅛-in. pipe tap.
3. Cut threads on other end with ¼-in. pipe dies.

*Holder for Shade — Part E*

1. Cut two pieces of band iron ⅛ by ⅜ by 16¼ in.
2. Grind one end of each piece as shown in Figure 4 and bend as in Figure 5. The taper end is to be used for the hook end.

*The Shades*

1. Lay out a template for the shades according to dimensions shown in Figure 6.
2. Trace this on No. 28 gauge sheet iron.
3. Cut out and drill ¼-in. holes where shown.



4. Drill rivet holes where shown on the one edge.
5. Roll until you have the required shape.
6. Punch or drill the other rivet holes and rivet with small tinners' rivet.
7. Punch a small hole in the top of the cone and solder in a small copper nail.
8. After you have turned up the edges of the shades, drill several ⅜-in. holes about ¾ in. from edges.
9. Assemble as shown.

Consult the teacher as to finish.

## OPERATION SHEETS FOR MACHINE WOODWORK

**V. E. Broadbent, Instructor Industrial Arts, Santa Clara, California**

### Operating the Jointer

*Reasons*

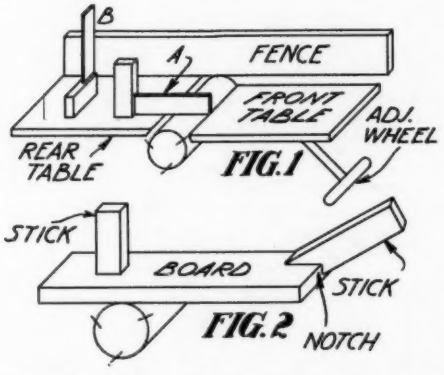
The jointer gets its name from the fact that its most common use is planing edges true so that they could be glued together, if desired. Such edges are called "joint edges."

*Tools*

Jointer, try-square.

*Directions*

1. Before using the jointer, test the rear table by placing a try-square on it as shown at A, Figure 1. If necessary, move the rear table up or down until the try-square just touches the knives at their highest position. The rear table is to be kept in this position at all times no matter what the amount planed.




2. Test the fence by placing a try-square as in B, Figure 1, and adjust the fence until it is exactly square with the rear table.
3. Set the front table (the infeed side) by turning the handwheel to regulate the amount to be planed. Test by starting the jointer and pushing a sufficiently long scrap piece across far enough to be able to measure the cut.
4. Start the jointer and slide the board across, with the best face pressed firmly against the fence. If the board is fairly straight, keep it pressed flat on the rear table as the wood leaves the knives. If the board is crooked, plane down the high spots and then plane as directed in the foregoing.
5. Special care must be taken to hold the board firmly against the fence so that the planed edge will be square with the face.
6. Always keep the fingers of the left hand extended or hooked over the fence in such a way that, were the board to fly back or tip over, the hand would not fall into the knives.
7. For planing the surface of thin boards (1 in. or less), use short sticks to push the stock through, as in Figure 2, instead of the hands only.
8. Do not attempt to joint boards shorter than 12 in.
9. Do not attempt a cut to a greater depth than ⅛ in.
10. Do not push the stock through too fast or the planer marks will be very conspicuous.

*Question*

If the three knives each make 3,600 revolutions per minute, can you realize how many cuts would result before you could jerk your hand away, if allowed, through carelessness, to fall on the knives?

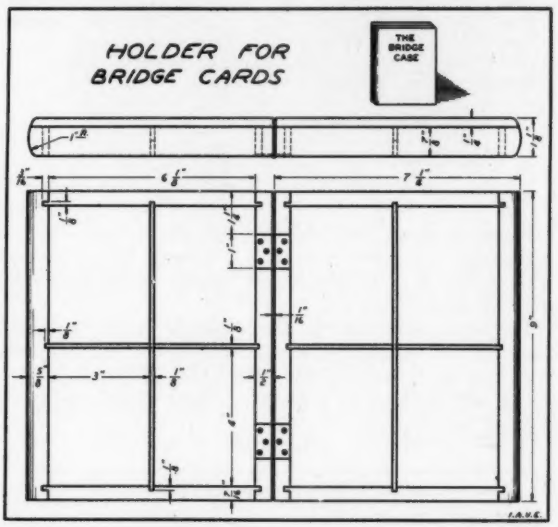
*Reference*

Hunt's *Manual for Machine Woodworking*, pp. 7–16.

## BRIDGE-CARD HOLDER

**S. T. Newton, Director of Technical Education, Winnipeg, Province of Manitoba, Canada**

At the beginning of the term most industrial-arts teachers like to have a simple project for their second-year classes in woodwork, one that appeals to the student and can be made in two or three sessions while the teacher is getting acquainted and finding out what his students can do.




The bridge-card holder described herewith is such a project. It holds enough cards for a four-table bridge party. When closed it looks like two books and can be placed on the library shelves where it is easily found when needed.

Apart altogether from the interest phase, this project embodies many fine tool operations: butt, dado, dado-rabbet and cross-lap joints, accurate measuring, careful planing, hinge setting, finishing, good thought and careful planning.

It may be made of basswood and stained with mahogany or walnut, or it may be finished to harmonize with the books in the library. The more expensive woods, such as red gum, mahogany, or walnut, also may be used.

It is glued up as one box and then sawed in two. The partitions are put in place after it has been sawed apart.

It is best if the teacher makes this card holder before the class appears. I have observed a class take only a passive interest in this project while the teacher told them about it, while another class was electrified when they saw the actual object and how much it looked like two books when closed. Naturally the teacher who has sufficient initiative to make the holder will present its advantages to the class in a more convincing way than the man who has only a blue print and perhaps not that.

## HOW TO MAKE A TOY MOTOR

**Joseph Felberbaum, Hadley Vocational School, St. Louis, Missouri**

Nothing will arouse more enthusiasm in a boy taking electrical work than the experience of building a motor. At the same time, this project will teach him many principles of electricity and spur him on to careful work.

In selecting the kind of motor to make, the instructor has

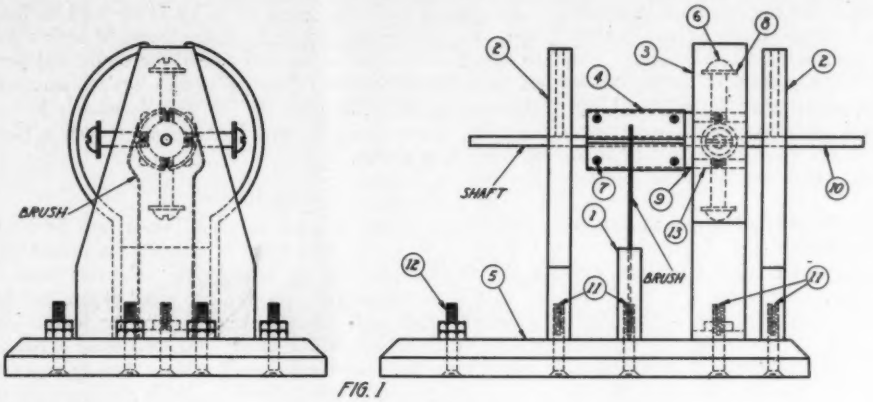



FIG. 1

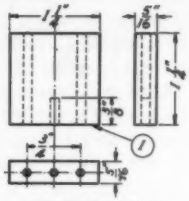
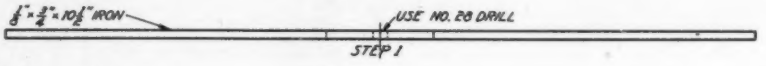



FIG. 3



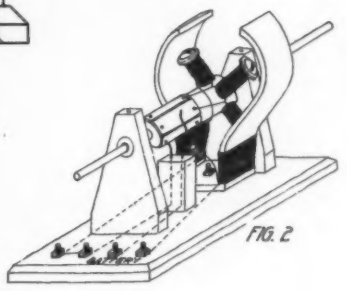



FIG. 2

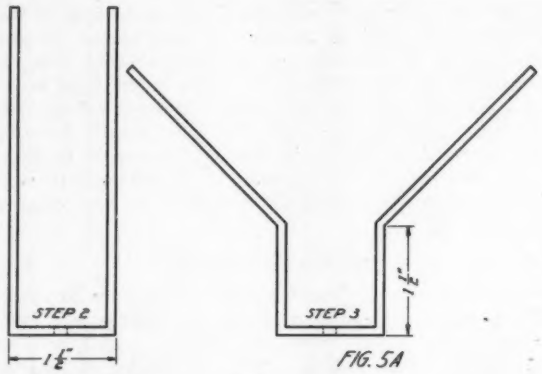



FIG. 5A

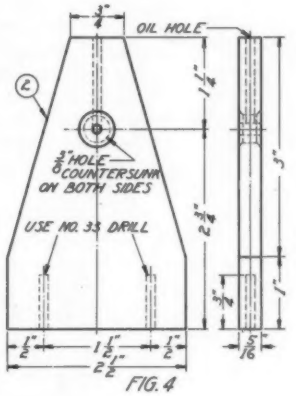



FIG. 4

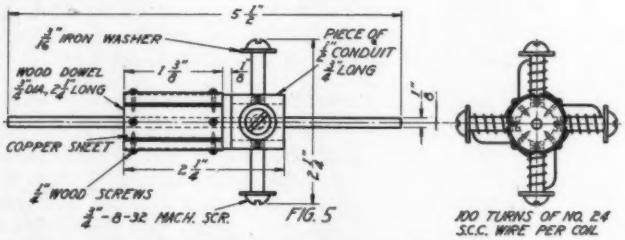



FIG. 5

100 TURNS OF NO. 24 S.C.C. WIRE PER COIL

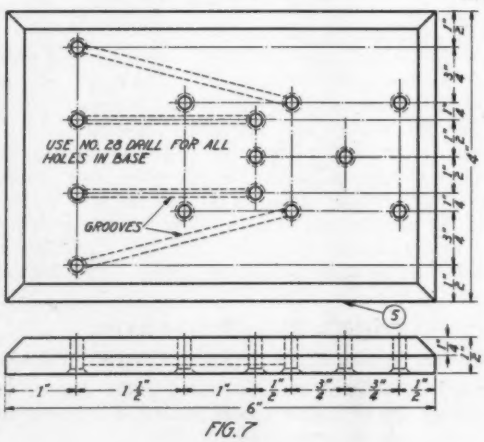



FIG. 7

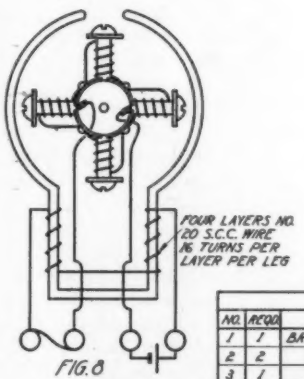



FIG. 8

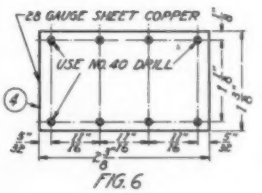



FIG. 6

# TOY MOTOR

BILL OF MATERIAL

| NO. | REQD | NAME | MATERIAL | SIZE |
|---|---|---|---|---|
| 1 | 1 | BRUSH HOLDER | FIBER | 5/16" × 1 1/4" × 1 1/4" |
| 2 | 2 | PEDESTAL | FIBER | 5/16" × 2 1/2" × 4" |
| 3 | 1 | FIELD | IRON | 1/8" × 3 1/4" × 10 1/2" |
| 4 | 1 | COMMUTATOR | SHEET COPPER | 1/16" × 1 3/8" × 2 1/8" |
| 5 | 1 | BASE | WOOD | 1/2" × 4 1/2" × 6" |
| 6 | 4 | MACHINE SCREW | IRON | 3/4" - 8 - 32 |
| 7 | 8 | WOOD SCREW | BRASS | 1/4" - NO. 3 |
| 8 | 4 | WASHER | IRON | 3/16" |
| 9 | 1 | DOWEL | WOOD | 3/4" × 2 1/4" |
| 10 | 1 | SHAFT | DRILL ROD | 1/8" × 5 1/2" |
| 11 | 6 | MACHINE SCREW | IRON | 1" - 6 - 32 |
| 12 | 4 | BURRS | IRON | 3/16" |
| 13 | 1 | ARM. CORE | IRON COND. | 1/2" × 3/4" LONG |

I.A.V.E.

several things to consider. He is limited by the knowledge and mechanical skill of the pupil, and the cost must be small.

The motor herein described can be made by any junior-high-school student who has average mechanical ability. The materials are available in any electrical shop. It has been made by boys of the continuation department of the St. Louis public schools for over a year and has proved to be very practical and very popular. These boys range in age from fourteen to sixteen years, and none have advanced beyond the eighth grade.

It will develop a speed of 2,000 revolutions per minute or better, on two dry cells or on six volts a.c.

Figure 1 is a working drawing of the motor assembled, and Figure 2 is a view in perspective.

#### Base

The base is made of wood ½ by 6 by 4½ in. with a ¼-in. bevel all around. All holes are drilled with a No. 28 drill and countersunk. Grooves are cut in the underside for the field and brush leads going to the binding posts in front (see Fig. 7).

#### Pedestals

The pedestals are made of fiber 5/16 in. in thickness (wood can be used if fiber is not on hand), of the size and form shown in Figure 4. The solder bearing is made in the following manner: Through the center and 2¾ in. up from the bottom, drill a ⅜-in. hole. Countersink on both sides and fill with solder. The solder will be held in place by flowing into the countersunk area. File smooth and drill a ⅛-in. hole through the center of the solder portion to take the shaft of the armature. In drilling the hole through the solder of the second pedestal it is well to line up with the one already finished and drill while together. This will insure the holes being exactly in line. The pedestals are held on the base by two 1-in. No. 6–32 machine screws. The holes in the pedestals are ¾ in. deep, and are drilled with a No. 33 drill and threaded with a No. 6–32 tap.

It is best to drill and tap but one hole in each pedestal, then fasten them in position on the base and mark the place for the other hole. This will insure the exact alignment of the holes in the base and the pedestal. The oil holes are drilled with a No. 40 drill (see Fig. 4).

#### Armature Core

File one end of a piece of ½-in. iron conduit perfectly square. Mark a line ⅜ in. from the squared end all around the pipe, and with a center punch mark four equally spaced points upon it. Drill the four holes with a No. 29 drill. Thread with a No. 8–32 tap. Place a 3/16-in. burr on a ¾-in. No. 8–32 r.h. iron screw and screw into each hole (see Fig. 5). This is the core of the armature.

#### Commutator

Cut a piece of ¾-in. wood doweling to 2¼-in. in length. With a No. 33 drill, drill a hole through lengthwise exactly in the center. Cut down one end of the doweling a distance of ¾ in. so that the ½-in. piece of conduit fits snugly over it. Make the shoulder square. Next, obtain a piece of No. 28 gauge sheet copper 2⅜ by 1⅜ in. and drill holes as shown in Figure 6. Use a No. 40 drill. Wrap the copper about the doweling, starting with one edge in line with one of the holes drilled in the iron conduit. Fasten it to the doweling with eight ¼-in. No. 3 brass wood screws. Saw the copper sheet lengthwise, halfway between each pair of screws and thus get the four commutator segments. Brass tubing can be used instead of the sheet copper if preferred. Put the core in place on the doweling and screw down the machine screws upon it (see Fig. 5). Drive a ⅛-in. diam. piece of drill rod 5½ in. long through the doweling. The armature is now ready to be wound.

#### Field

The field is made of a piece of ⅛ by ¾ by 10½-in. band iron. Find the middle and drill a hole through it with a No. 28 drill. Scratch lines ¾ in. each side of the center and bend on these lines in the vise forming a *U* with legs 1½ in. apart. Measure up 1½ in. on each leg and bend forming a *Y* (see Fig. 5A). Form the upper part by rounding it over a piece of conduit, as shown.

#### Brush Holder

The brush holder is made of fiber (wood may be used) 5/16 by ¼ by 1¼ in. Two holes ¾ in. apart are drilled with a No. 40 drill (see Fig. 3). Remove the insulation from 20 in. of No. 18 copper wire; cut into two equal pieces, and run a piece through each hole. In the center of the bottom end of the brush holder, drill a hole ¾ in. deep using a No. 33 drill. Thread with a No. 6–32 tap. A No. 6–32 machine screw, 1 in. long, passing through the base, holds the brush holder in position.

#### Winding the Armature

Use No. 24 s.c.c. or d.c.c. wire. Leave about 6 in. of wire extending and wind on 100 turns on any one of the four machine screws screwed into the armature core. Bare the wire and fasten under the nearest one of the wood screws that hold the commutator segments to the doweling. Wind the next coil and repeat until all four are wound. Twist the beginning and end of the wire together; remove the insulation from both ends and fasten under the remaining brass wood screws. Be careful to wind all the coils in the same direction (see Fig. 8).

#### Winding the Field Coil

The field coils are wound with No. 20 s.c.c. or d.c.c. wire. Put a layer of tape on the part that will hold the wire. Leave about 8 in. of wire extending and wind with four layers containing sixteen turns per layer on one leg of the field. Put the same number of turns and layers on the other leg, but be sure to wind in the opposite direction. Leave about 8 in. of wire extending from the end of the winding.

#### Assembling the Motor

The motor is now ready to be assembled. Fasten the field to the base with a ¾-in. No. 6–32 bolt and run the ends of the field coil through the two holes drilled in the base for that purpose to the underside of it, and to the two outer binding posts. Fasten the brush holder, with the brushes in place, to the base with a 1-in. No. 6–32 machine screw. Connect to the two inner binding posts.

Fasten the pedestals and armature in position, and make any adjustments needed. The armature should turn freely and if the work is carefully done will be well balanced. Adjust the brushes to bear on the commutator. Connect the two binding posts on the left-hand side of the motor together with a piece of wire and across the other two posts connect one or two dry cells in series. If four to six volts a.c. are available this may be used intead of direct current with just as good results. If the work has been done carefully the motor will start right up and run at a speed of 2000 r.p.m. or better.

## SLIDING BLACKBOARDS

**R. A. Werner, Franklin Junior High School, Racine, Wisconsin**

Frequently blackboard space is limited in the shop or the drafting room. The sliding blackboard illustrated and described herewith was designed to overcome this defect.

The stationary blackboards C and D, shown in Figure 1, are securely fastened to the wall after which the upper and lower slides F and G are fastened in place. The sliding blackboards A and B are then put into their proper grooves and the end pieces fastened in place to prevent the boards from sliding

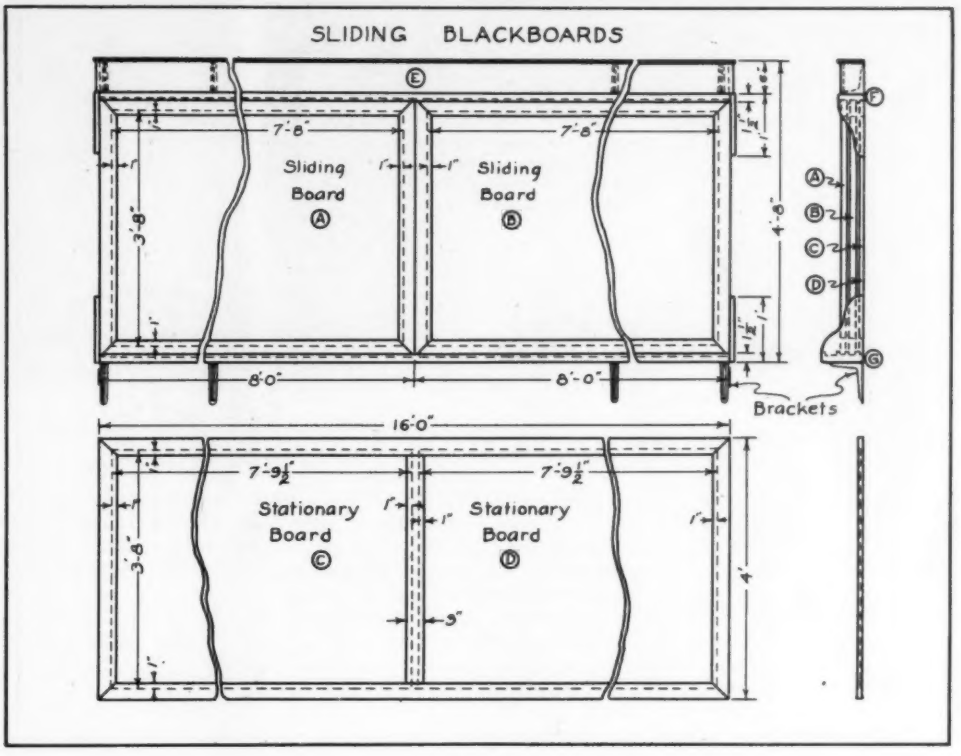

SLIDING BLACKBOARDS
Sliding Board
Sliding Board
Stationary Board
Stationary Board
Brackets
16'-0"
8'-0"
8'-0"

*Fig. 1*

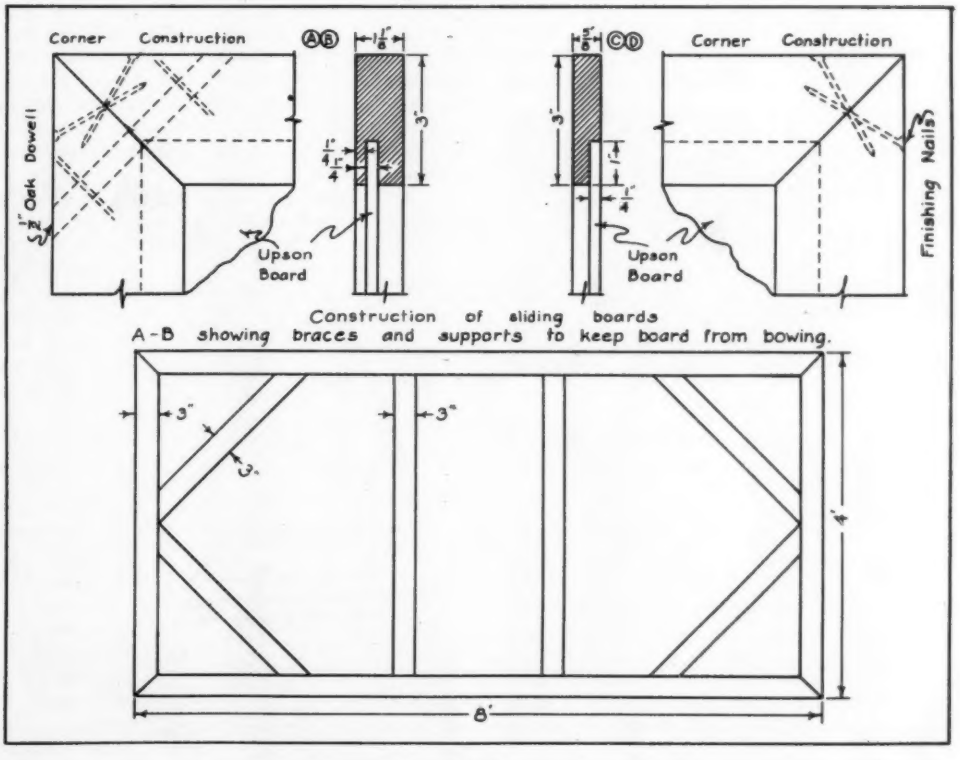

Corner Construction
Corner Construction
1" Oak Dowell
Upson Board
Upson Board
Finishing Nails
Construction of sliding boards
A-B showing braces and supports to keep board from bowing.
8'

*Fig. 2*

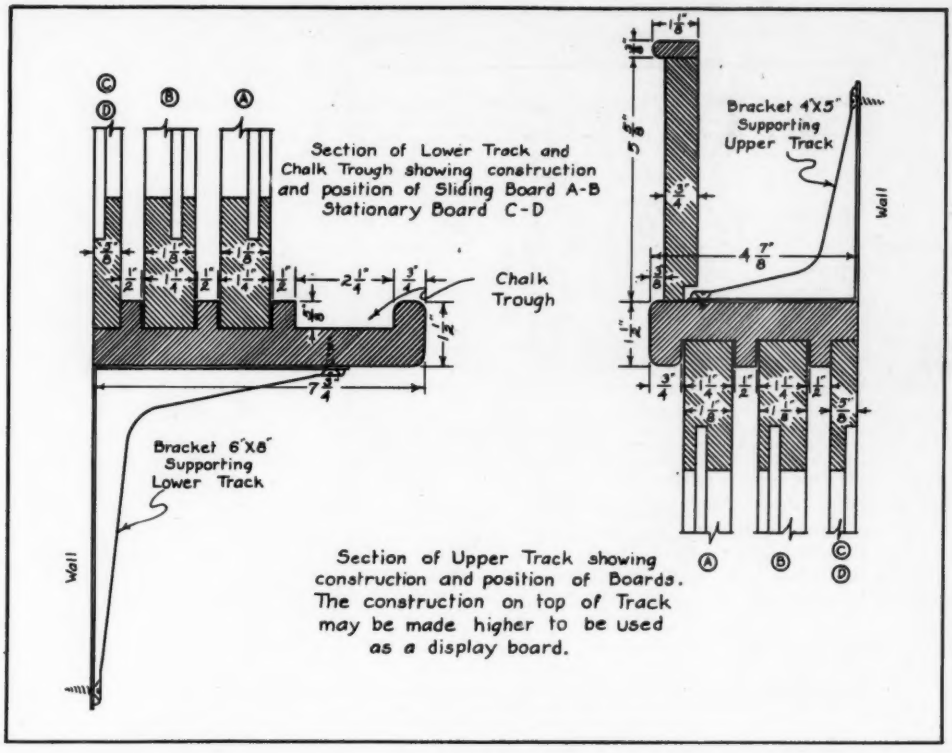
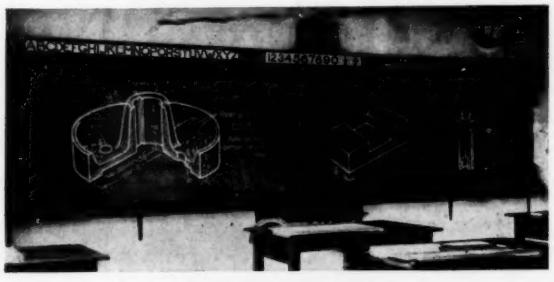

Section of Lower Track and Chalk Trough showing construction and position of Sliding Board A-B Stationary Board C-D
Chalk Trough
Bracket 6"X8" Supporting Lower Track
Wall
Bracket 4"X5" Supporting Upper Track
Wall
Section of Upper Track showing construction and position of Boards. The construction on top of Track may be made higher to be used as a display board.

*Fig. 3*

out over the ends. The blackboards A and B may now be slid back and forth in front of the boards C and D, thus giving access to four boards, although they do not occupy more than the space of two. Either the natural or the artificial slate



*Sliding drawing boards*

boards may be used. A good substitute may be made by placing a smooth wall board into a frame similar to the one shown in Figure 2. The wall board must then be painted with one of the commercial slate preparations. The construction of the top board E shown in Figure 1 is merely suggestive. While it is primarily used to hide the upper brackets which hold the blackboard to the wall, nevertheless it may also do service as a display board for exhibiting drawings or illustrative material. The details of the upper and lower sliding supports are shown in Figure 3. The design of the end brackets, which are used as braces as well as stops or bumpers for the slides, also may be changed to suit conditions. If desirable they may be changed into complete end inclosures.

## ROUND SEWING CHAIR

**Herbert Bast, Sheboygan, Wisconsin**

The frame for the sewing chair illustrated here is made from two candy pails which can be purchased at most any candy or grocery store.

As the pails vary in size and shape, it is impossible to state sizes or patterns for the wood parts needed, but with the illustrations the method of construction can easily be followed. The back is made of the sides of one of the pails. The width of the back should be about one third of the circumference of the pail top and should be fastened to an extra piece of wood that is cut half-round and fastened to the top, as shown in Figure 1.

To get an even surface on the bottom of the pail, two crosspieces of wood are first fastened to the bottom to which the front legs can then be attached from the inside by means of screws. The rear legs are made to go up the sides high enough to act as a brace for the back at the same time.

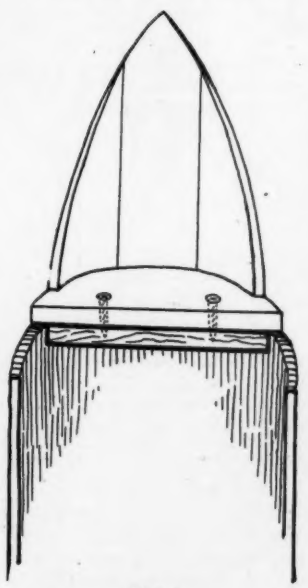


*Fig. 1*

Should the back consist of a number of staves, it can be stiffened by nailing strips of tin or sheet metal crosswise both inside and out. This will not interfere with the upholstery but will strengthen the back.

The top cover is cut so it extends over the frame about 1 in. and is fastened with hinges so access can be had to the inside.

The upholstery is very simple as the only stuffing or cotton felt required is for the seat top and the inside of the back. The chair may be

*Fig. 2. Round sewing chair*

made with or without the pleating around the bottom, but where no pleating is used the cover should be tacked to the bottom of the frame. For description of how the upholstery is applied see the article on "Art Moderne Sewing Chair" in the April, 1933, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

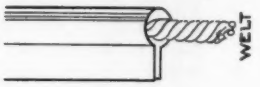



*Fig. 3*

Procedure for box pleating:

*a*) Cover a cord with the same material as the covering (or a contrasting colored material may be used) and tack same to frame all around 7 in. from the floor. For covering cord see Figure 3.

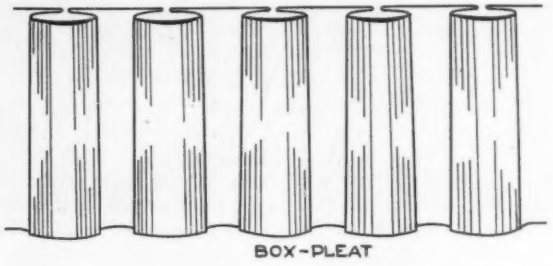


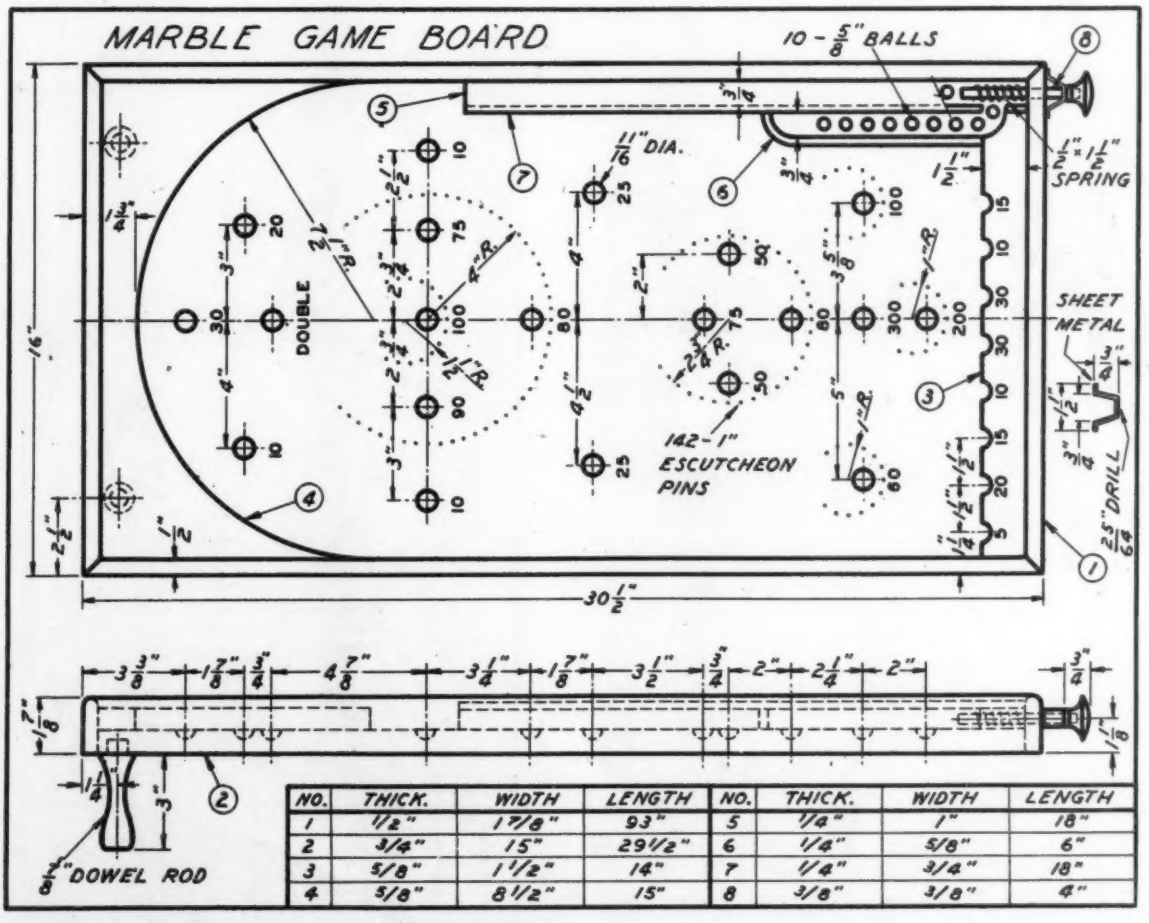

*Fig. 4*

*b*) Make a box pleating long enough to go all around the chair, and tack it under the corded welt. The box pleating should hang 1 in. from floor. For box pleating see Figure 4.

The inside of the frame may be painted or lined with cretonne, denim, or cambric. When chair is used as a sewing cabinet, a pin cushion may be tacked to the underside of the seat.

The legs can be finished in natural wood or painted in colors to match or to contrast with the covering.

Cretonne or chintz are appropriate coverings for this type of chair. If the chair is to be used as a sewing chair a pin cushion may be fastened to the inside of the cover.




| NO. | THICK. | WIDTH | LENGTH | NO. | THICK. | WIDTH | LENGTH |
|---|---|---|---|---|---|---|---|
| 1 | 1/2" | 1 7/8" | 93" | 5 | 1/4" | 1" | 18" |
| 2 | 3/4" | 15" | 29 1/2" | 6 | 1/4" | 5/8" | 6" |
| 3 | 5/8" | 1 1/2" | 14" | 7 | 1/4" | 3/4" | 18" |
| 4 | 5/8" | 8 1/2" | 15" | 8 | 3/8" | 3/8" | 4" |

(*See article on following page*)

## MARBLE GAME

**Lee H. Miner, Collinwood High School, Cleveland, Ohio**

The marble game described herewith has created a great deal of interest in our high-school shop. It is not only a game for the young, but the old have found it equally interesting.

In most cases the boys brought in their own material for the game. There is no need to be particular about the kind of lumber used as long as the sizes in the drawing can be followed.

### Directions

*The Base.* Select two pieces at least 7½ in. wide and 29½ in. long, or use a piece of ¾-in. 5-ply fir which is 15 in. wide and 29½ in. long. Locate all the holes and bore with No. 12 bit as deep as possible without having the point of the bit come through the bottom. Mix some plaster paris and water, and fill up these holes. Before the plaster has had time to set, take the end of a file handle or any object that has a rounded end and revolve it in the hole until the depression is cupped out sufficiently to hold the marble.

*The Circular Top Piece.* This may be made of one or two pieces glued to the base, after having cut out the circle on the band saw.

*Frame.* The pieces are mitered, glued, and nailed to the base.

*The Runway Strip.* The side piece of the runway strip has an opening cut in it to admit the marbles from the marble feeder, when the driver is drawn out. The strip is glued and nailed into place.

*Cover of Runway.* The runway cover should be fastened on with screws so that it may be removed easily if anything goes wrong with the spring.

*The Feeder.* This piece is cut out with a coping saw or on a band saw. It is glued and nailed into place. It holds the marbles until the player uses them in making his shots.

*The Notched Bottom Piece.* This may be made by boring the holes and then ripping the piece through the center. The free play of the marbles in feeding is taken care of in this piece by cutting out a piece as shown in the illustration.

*The Driver.* This piece may be turned on the lathe, or a piece of ⅜-in. dowel rod, glued into part of a spool, may be used.

*The Spring.* This we obtained from some old spring shade rollers. One of these springs was sufficient to make four or five of the games.

*The Sheet-Metal Piece.* This is an added feature which can be done away with if desired.

*Tacks.* Use 1-in. escutcheon pins, arranging and driving them in as shown in the illustration. Be sure that the base is scraped and sanded and finished before they are driven into place.

*The Lettering and Numbers.* We used a lettering pen with india ink. This made a very quick and good-looking job.

*The Holes.* All marble holes were painted with four-hour jade green except the *double* hole, which was given a coat of vermilion.

*Finish.* Some used stain, but in most cases we used linseed oil with white shellac; rubbed down between coats with 2/0 steel wool. All nails were set and the holes filled before the finish was applied.

There are no set rules for playing this game.

## REBORING FIXTURE

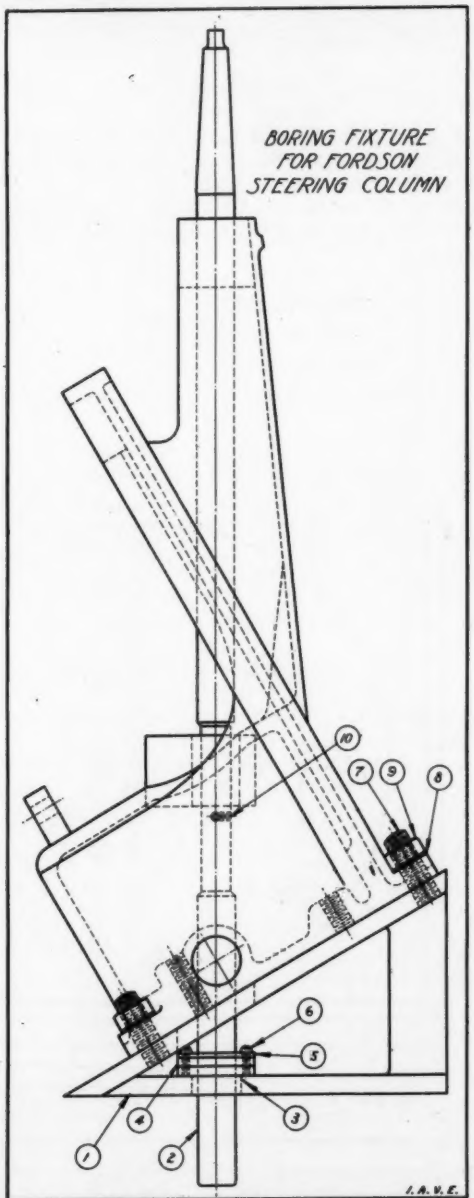
**Frank L. Young, Chaffey Union High School, Ontario, California**

Shown here is a fixture which makes a difficult job easy. The lower bearing on the dashboard of a Fordson tractor wears to the extent that the bevel gear fails to mesh with the segment gear. Because the base of the dash is on an angle with the holes, the set-up for an ordinary boring job is not easily managed.

The fixture used is made of angle iron, welded and machined to the correct angle. When the dash is mounted on the fixture, with the boring bar in place, the upper bearing in the dash makes one guide, while the bushing in the fixture forms the other. The dash is then strapped in place. The guide bushing in the fixture has a felt washer, held in place, to avoid any chips interfering with the boring bar.

### Operations

1. Bore dash to 1¼ in. diameter.
2. Turn shaft to a standard size (if worn).
3. Bore and ream bushing (either cast iron or bronze) to fit shaft.
4. Turn bushing for a drive fit in the dash.
5. Saw bushing partly through, lengthwise.
6. Split bushing.




| NO. | MATERIAL | REQ. | NAME |
|---|---|---|---|
| 1 | STEEL | 1 | BASE |
| 2 | STEEL | 1 | BORING BAR |
| 3 | STEEL | 1 | GUIDE BUSHING |
| 4 | STEEL | 1 | FELT WASHER |
| 5 | STEEL | 1 | BUSHING COVER |
| 6 | STEEL | 2 | BUSHING COVER SCREWS |
| 7 | STEEL | 4 | LOCATING STUDS |
| 8 | STEEL | 4 | WASHERS |
| 9 | STEEL | 4 | STUD NUTS |
| 10 | STEEL | 1 | CLAMP SCREW |

When assembling, to avoid this wear occurring again, a felt washer is used with a steel washer and an old valve spring. Drill a hole in the shaft for a ⅛-in. cotter key. One side of the washer has to be cut so it will not interfere with the rib in the dash. When the shaft is driven in place, collapse the spring and insert the cotter key. If the bevel gear is given a half turn when the final assembly is being made, new teeth will be brought in contact with the segment gear.

Anyone living in an agricultural district will find this fixture invaluable, as much time will be saved, and there will be considerably less cost to the tractor owner.

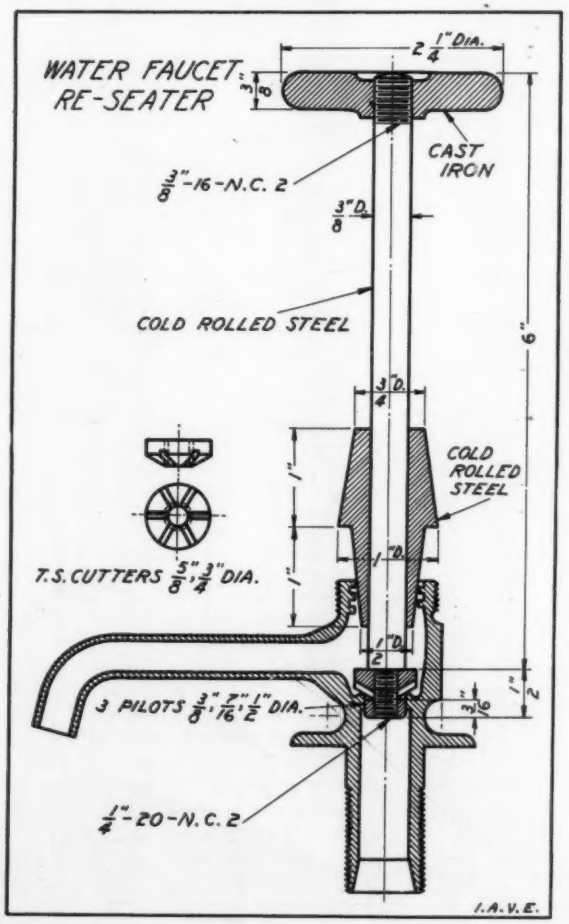
## WATER FAUCET RESEATER

**L. G. Burgess, Northwestern High School, Detroit, Michigan**

The repair of common water faucets is a job sheet in almost all household-mechanics courses. Briefly, the ordinary compression faucet consists of a valve in which a rubber washer is forced against a metallic seat, with a turning motion. Water attacks the metal of the seat and roughens it, and the turning motion used in closing the faucet, causes the washer to rub on the seat, and depending on the roughness, wears down the washer. Worn washers make it difficult to close the opening, and simply to replace the washer is not enough. The seat should be made smooth.

With the faucet reseater illustrated, this job is a comparatively simple one. If the seat is badly pitted, or the valve is one of the old type with a flat seat, a cutter like the one shown should be first used to shape a perfect seat. When this has been done, replace the cutter with a washer of the type used in the faucet; over this screw a disk of emery paper, easily cut with the dead center of a wood lathe as a punch, screw down the lower pilot tightly, and smooth up the seat.

The design of this tool has been purposely made very simple so that it can be produced with the minimum of equipment. Both the handle and the upper guide may be made of maple wood, or of metal. The stem is a piece of ⅜-in. rod, the lower pilots can be made of ¼-in. hexagon nuts turned to the proper size. The cutters may be obtained from the Bochum Tool Company, Box 32 Northwest Station, Detroit.




## MAKING A FLOOR-LAMP BASE

**F. E. Tustison, The Stout Institute, Menomonie, Wisconsin**

The following lamp base offers a type of construction adaptable to any general shop. Only simple tool operations are involved. No welding is required and if simple lines are carried out, heating is not necessary. The base shown in Figure 1 was formed entirely cold. If heating is necessary to form scrolls of small radii, the common soldering furnace will usually suffice.

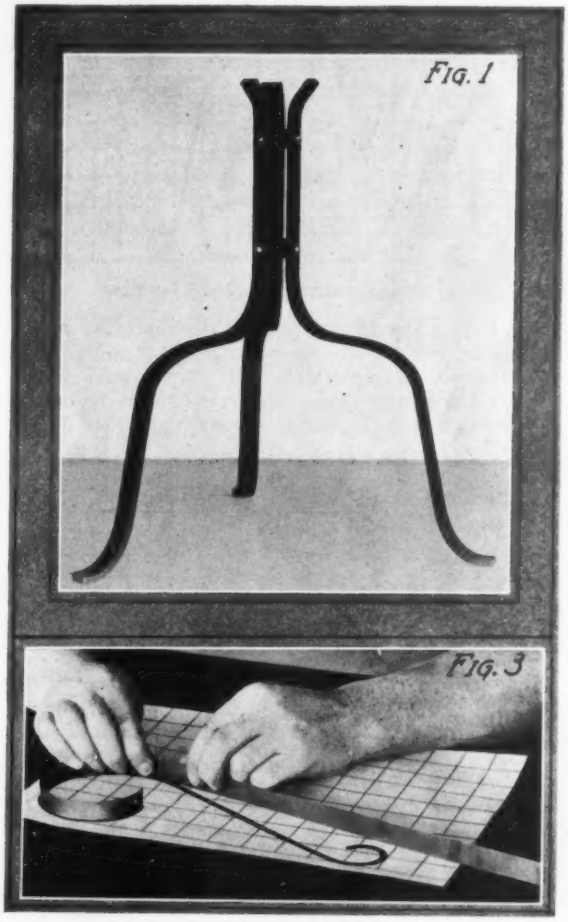



*Fig. 1. Floor-lamp base. — Fig. 3. Determining the length of stock required*

This base will accommodate various shapes and sizes of uprights. Solid round rod, solid hexagonal rod, or iron pipe are recommended. It is only necessary to drill or file the central nuts to suit.

Several choices of legs are shown, and many other original designs are possible. By using square nuts a base with four legs can be made.

The material given is for the base illustrated using a ½-in. solid upright.

The lamp may be finished to suit the taste of its maker. Hammer marking is a favorite method.

*Tools:* Rule, scriber, hack saw, file, bending fork, center punch, hammer, twist drills, drilling machine, 12–24 tap, tap wrench, screw driver.

*Material:* ¼ by ¾-in. mild steel; 2 hexagon nuts 9/16-in. tapped or blank; 5 r.h. No. 12 by ⅜-in. iron machine screws; 1 r.h. No. 12 by ½-in. iron machine screw.

**Procedure**

1. *Make Full-Sized Sketch of a Leg.* Select the type of leg desired and draw it full size on paper with 1-in. cross sections.

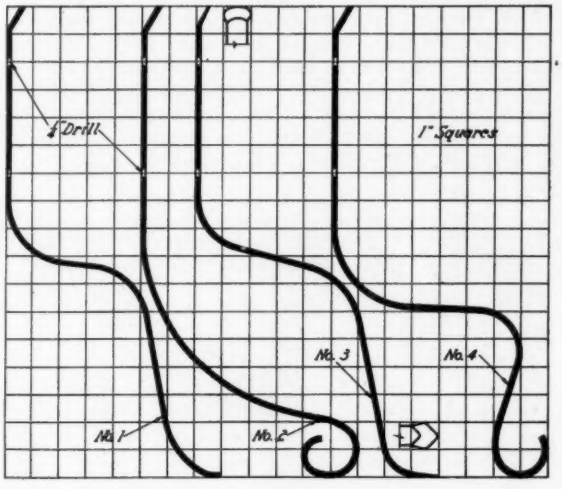



*Fig. 2. Suggested leg patterns for base*

Figure 2 shows how this may be done. There are many possible leg patterns and each student should make his own design.

2. *Determine Length of Leg Stock.* With a small wire, or better, a long narrow piece of sheet metal, bend the form of the leg (see Fig. 3). Test often by laying the pattern directly on the drawing. When the shape is correct, cut the pattern to the exact length. The length of the leg stock is then determined by straightening out the pattern and measuring it.

3. *Cut the Stock to Length.* Lay out and cut the legs to the measured length. If the leg ends are to be left plain, chamfer with a file. If some design on the end is desired, it may be best to form it at this time.

4. *Hammer-Mark.* If the legs are to be hammer-marked, do this before bending. The legs in Figure 1 are just plain.

5. *Bend the Legs.* Lay off for the bends from the bottom of the leg and mark with chalk or center punch. For forming curves use the bending fork. An illustration showing the bending of such legs appeared on page 199 of the June, 1932, issue of this magazine. For angle bends, use vise and hammer. Patterns Nos. 1 and 3, Figure 2, may be shaped cold, but it will be best to heat the iron for bending curves of small radii in ¼-in. stock. Stock thinner than ¼-in. stock may be bent cold. Use the full-sized pattern developed in step 1 to test the proper shape of each leg. Lay all the legs together so as to get them quite alike.

6. *Drill the Holes in the Legs.* Lay out, center-punch, and drill the holes in the legs.

7. *Drill and Tap Nuts.* Drill out centers of both nuts to fit the desired upright. One-half-inch solid rod is often used for this purpose. Where pipe is desired, check carefully for the outside diameter and drill accordingly. For a hexagon upright, use a hole equal to the diameter across the corners of the hexagon. For a square upright file the holes to fit.

Center-punch and drill the three alternate faces of each nut in preparation for the machine screws that fasten the legs. Tap the holes to fit the machine screws.

8. Fasten the legs to the nuts with the machine screws. One machine screw at least should extend slightly into the center of the nut in order to clamp the upright in place. A slight depression may be drilled in the upright at this spot.

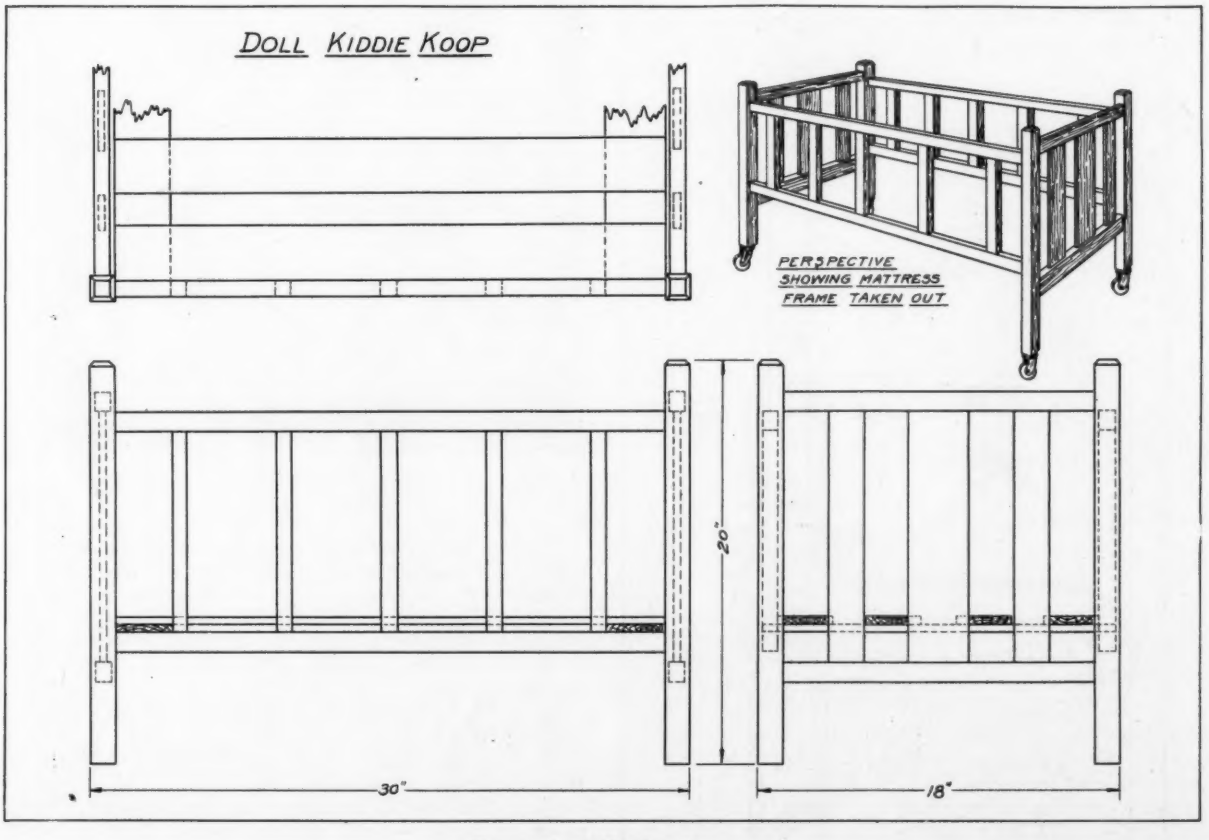



*Fig. 1. Assembly drawing*

## A DOLL KIDDIE KOOP

W. A. De Vette, Erie, Pennsylvania

Among the toys which a boy can make for his little sister or some other little girl, none will be appreciated more than a doll bed which is made just like the real baby's bed.

The construction is simple, all of the parts being straight and only the simplest joints being used.

Figure 1 shows the general arrangement with only the over-all dimensions and a picture of the completed bed. Figure 2 contains all of the details.

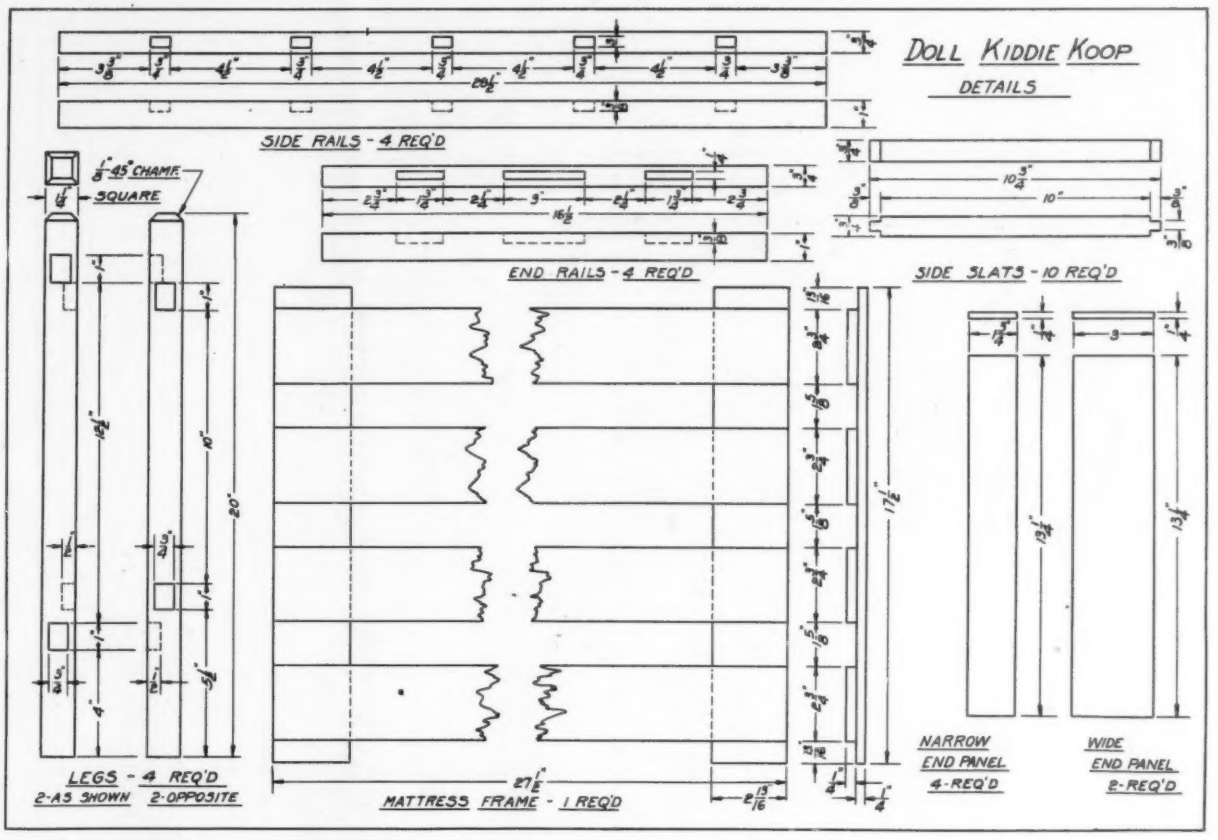



*Fig. 2. Details*

As the bed is to be finished in enamel or duco, any available wood may be used, poplar being preferred.

**Stock List (finished sizes)**

| | | |
|---|---|---|
| 4 pc. | 1¼ x 1¼ x 20 | Legs |
| 4 pc. | ¾ x 1 x 28½ | Side rails |
| 10 pc. | ¾ x ¾ x 10¾ | Side slats |
| 4 pc. | ¾ x 1 x 16½ | End rails |
| 2 pc. | ¼ x 3 x 13¼ | Wide end panels |
| 4 pc. | ¼ x 1¾ x 13¼ | Narrow end panels |
| 4 pc. | ¼ x 2¾ x 27½ | Frame slats |
| 2 pc. | ¼ x 2 13/16 x 17½ | Cross slats |
| 4 Casters (plain or ball bearing) or | | |
| 4 Domes of Silence, ¾-inch diameter | | |

After getting the stock, plane the parts to the over-all dimensions shown on the detail sheet. Whenever possible, put all like pieces in the vise at one time and it will be easier to make them of uniform size.

When all parts have been brought to size, clamp the four legs together and lay out the holes for the side rails. After this, take off the clamp, lay the legs together in two pairs with the layouts of the holes face to face. Put the four pieces back in the clamp and lay out the holes for the end rails. Cut the mortises, taking care to make each of them ½ in. deep.

Lay out and cut the side rails and side slats. These may be immediately put together as two units, two side rails, and five slats in each.

Now lay out and cut the end rails.

Put the end rails, end panels, and legs together as two units and set away. While the glue is setting, make the mattress frame.

Clean up each unit before the final assembly.

Assemble with cold glue, thus allowing sufficient time to draw the corners up square. Use two bar clamps diagonally if necessary before drawing the joints up tight.

A slight amount of fitting may be necessary in putting the frame in place. Remember that it must fit sufficiently free not to scratch the paint when being taken out or replaced.

One coat of flat paint and one coat of gloss duco should suffice for finishing.

The casters, or domes of silence, are to be put on last. If casters are used, holes must be bored to fit the sleeves which must be driven into the ends of the legs.

## CHECKING PRESSWORK

R. Randolph Karch, Arsenal Junior High School, Pittsburgh, Pennsylvania

Much trouble is often experienced when boys of little or no experience feed presses. The usual trouble is in "keeping up color." This is especially true on presses which have no ink fountains.

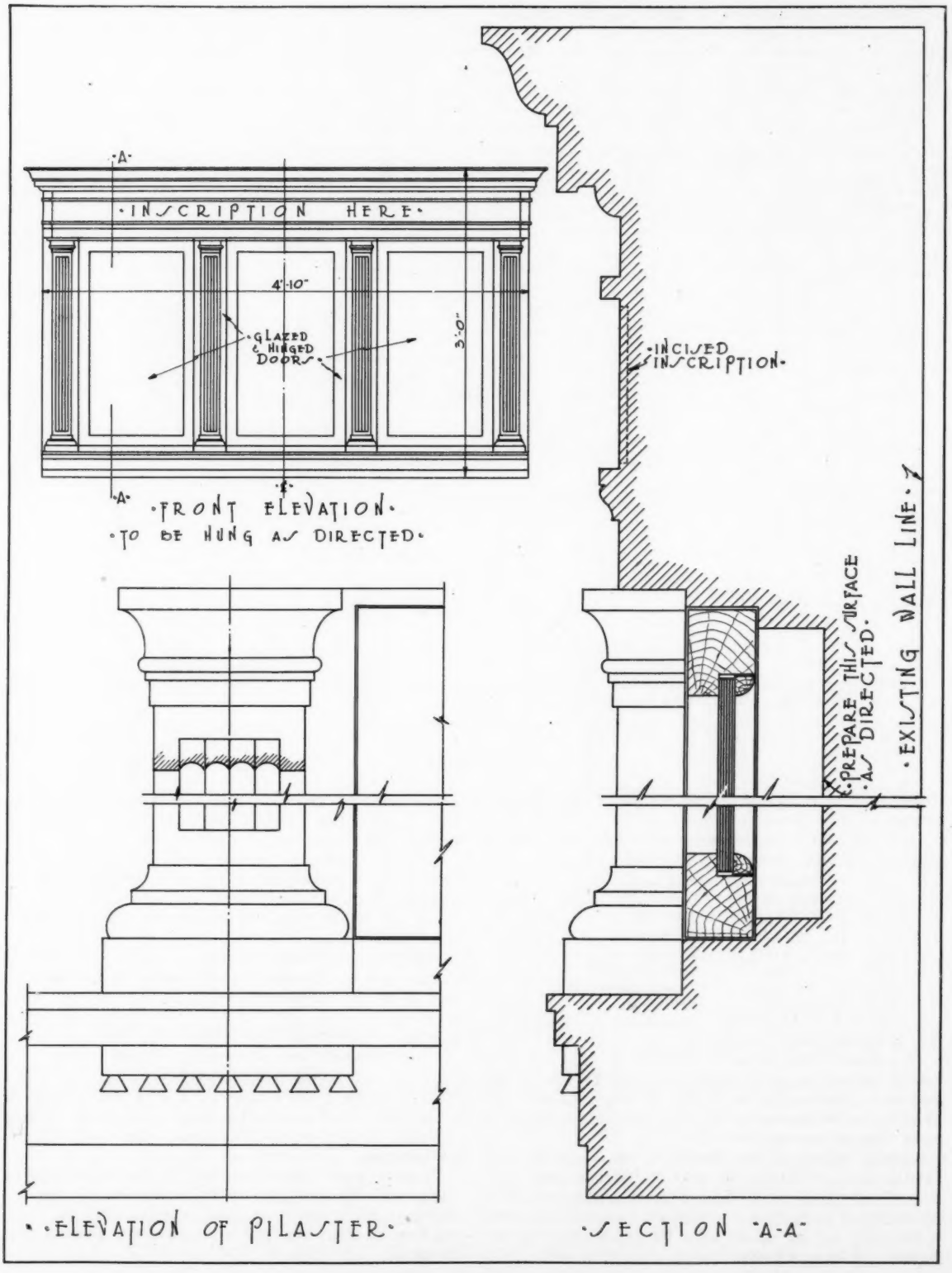
To avoid poor color, insist that the feeder submit each 100th sheet for inspection. As it is rather difficult for any busy instructor to constantly check color, this automatic check will keep his mind free from worry about the ultimate color on the job.

## BEAUTIFYING THE SCHOOL

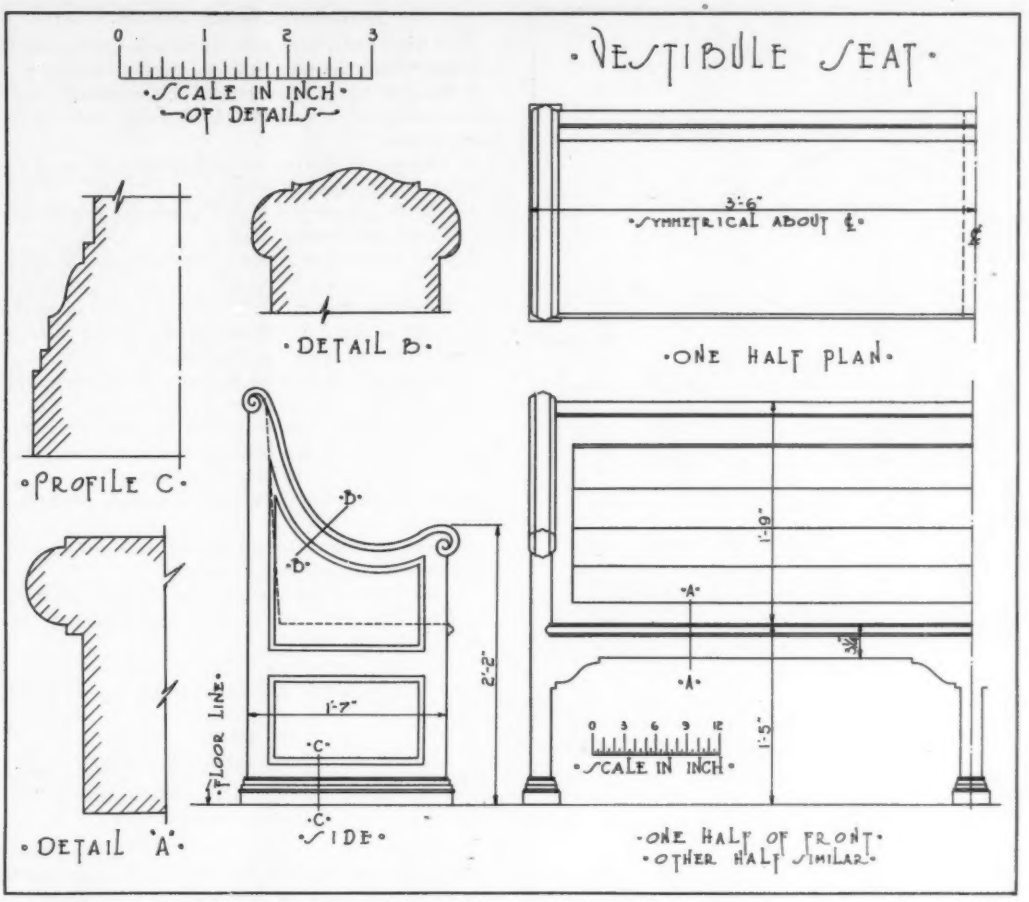
**Louis B. Warren, Rye Country Day School, Rye, New York**

The vestibule seat, honor-roll cabinet, and sign board, shown herewith, are all projects which present opportunity for ingenuity, initiative, and individual design. The designs for the projects shown were made in our mechanical-drafting class.

Two vestibule seats were made, one for each side of the door. The three projects are all colonial in design. The sign board combines simple wood turning, metal work, and woodwork. The drawings are to scale and are self-explanatory.




*Honor-roll cabinet, designed by Louis B. Warren, Rye Country Day School, Rye, New York*




*Vestibule seat, designed by Louis B. Warren, Rye Country Day School, Rye, New York.* *(See page 332 for design of sign board)*

## CIRCULAR SAWS, THEIR CHARACTERISTICS AND USE—VII

**John E. Doren, Supervisor of Industrial Education, Eureka, California**

(Continued from July)

The wabble may be ever so slight and not discernible to the eye, but a wabbling saw will make a rattling noise when in a cut, much like a saw that is struck light blows in very rapid succession. A rattling, vibrating, noisy saw will not cut clean, and may throw the work back at the operator.

2. *Adjustment of the saw.* The saw will cut best if it cuts through the stock and projects above the stock from ⅛ to ¼ in. If the saw projects above the stock too much, there is danger of the work pinching the saw which may result in a kick-back.

3. *All stock must be properly prepared.* It is recommended that all stock cut with the hollow-ground saw shall first be finished true and smooth on two sides, and at least one edge. *Under no circumstances* should *crooked, warped,* or *cupped* material be *cut* with a hollow-ground saw.

4. All work must be properly supported.

*a*) Because of the small amount of side clearance provided by the hollow grinding of the saw blade, the work must be well supported on the saw bench and against the guiding fence or gauge; any sudden or unexpected movement of improperly supported work may cause the saw to be pinched in the cut. The pinching of the saw by the work may result in a kick-back; this is especially true if the saw is pinched while ripping short pieces of lumber.

*b*) A saw that is pinched in a cut may be buckled or burnt or even cracked, either of which will render the saw useless for accurate cutting until it is repaired, and may also cause injury to the operator in case of a kick-back. In any event the cutting will be inaccurate. For accurate, smooth cutting, the work must be wisely and securely supported. If but one face and one edge of the stock are finished straight and true, one of these surfaces must be placed on the saw table and the other true face against the guiding fence or gauge.

*c*) The top of the saw bench or table *must be kept clean.* There must be no dust or chips to interfere with the work. The work must make close contact with the top of the machine and also with the guiding fence or gauge.

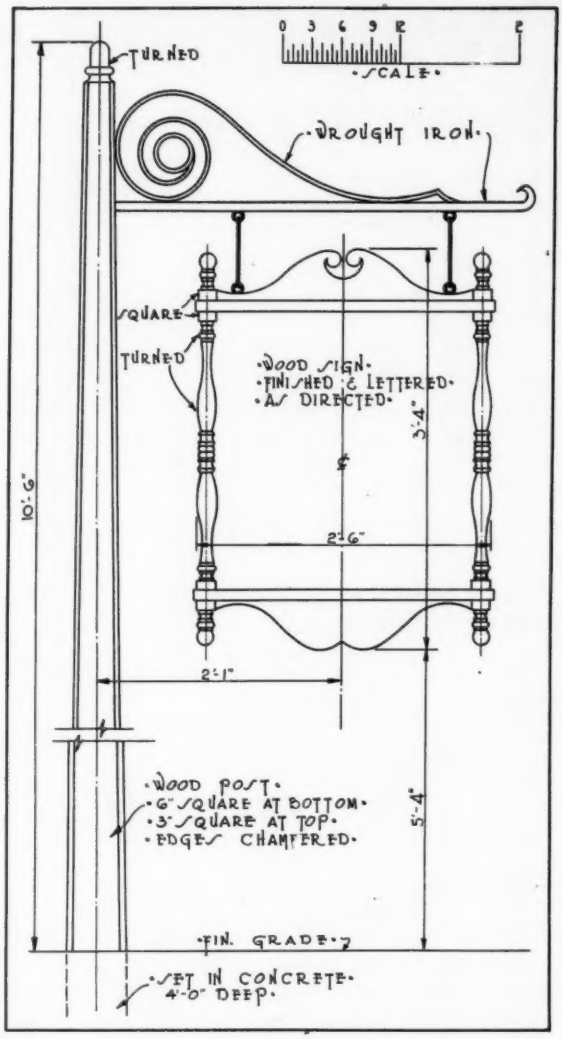
5. Proper fences, guides, or gauges must be used to insure clean, smooth, accurate cutting.

*a*) The crosscut fence and the miter gauges must be true on the face and must maintain exact alignment with the saw blade during a cut. Any shifting of alignment during a cut is dangerous to the operator and will always result in inaccurate or possibly ruined work.

*b*) The ripping fence must be true on the face and must be absolutely parallel with the plane of the saw cut.

E. *Warning:* The hollow-ground saw is recommended only for the cutting of nongummy woods. Teak, koa, Tennessee cedar, sugar pine, and pitch pine are gummy woods. The dust and gum from these woods adheres readily to the teeth and sides of the saw blade. A few short pieces of gummy woods may be cut, but the saw should be cleaned immediately after such use.

A long run of gummy woods should not be cut with a hollow-ground saw. When the sides of the saw blade become




*Sign board. See honor-roll cabinet page 330 and vestibule seat page 331*

gummy, more power is required to drive the saw, and more pressure is required to feed the work to the saw. Under these conditions the saw will heat and begin to wabble. If the cutting is continued and forced, the saw will be burned in spots and buckle out of shape. A saw in this condition is hard to refit for smooth cutting and may have to be remanufactured, viz., retempered, reground, hammered, polished, and sharpened, before it is again fit for use. The remanufacturing of a damaged saw usually costs about two thirds the price of a new saw blade.

### Hollow-Ground Rip- and Crosscut Saws

Hollow-ground saws are made with regular rip teeth and also with regular crosscut teeth for smooth sawing, and are designed strictly for smooth ripping and for smooth crosscutting, respectively. They will cut somewhat faster than the combination-tooth saws but they should not be forced to cut. They must be kept sharp.

The same operating conditions apply to the hollow-ground rip-saw as apply to the hollow-ground combination saw when it is used for ripping.

The same operating conditions apply to the use of the hollow-ground crosscut saw as apply to the use of the hollow-ground combination saw when it is used for crosscutting.

### Questions for Thought and Discussion

1. In what particulars does the smooth-cutting combination saw differ from the rough-cutting combination saw?
2. What is the purpose of the hollow-ground combination saw as compared, or contrasted, with the rough-cutting combination saw?
3. Why should this saw be used for the cutting of dry, well-seasoned wood exclusively?
4. Why is it poor practice to hurry the cutting when this saw is used for crosscutting?
5. Why is this saw slower in ripping than the regular rip-saw?
6. Why must this saw be kept sharp and clean on the sides?
7. What is likely to happen to this saw if it is used for cutting green or poorly seasoned lumber?
8. Why must the work be flat and well supported when this saw is used for either ripping or crosscutting?
9. What danger is there to the (*a*) operator, (*b*) to the work, or (*c*) to the saw blade, if this saw is used for ripping either warped or casehardened lumber?
10. What effect will the cutting of gummy woods have upon this saw?
11. What are the chief factors or characteristics by which this saw may be positively identified?
12. Why should the saw collars and the sides of this saw be wiped clean and free of dirt or pitch before the saw is mounted on the arbor?
13. In what ways do the hollow-ground rip- and the hollow-ground crosscut saws differ from the regular rip- and crosscut saws?

## CHECKING PRESS FEEDING

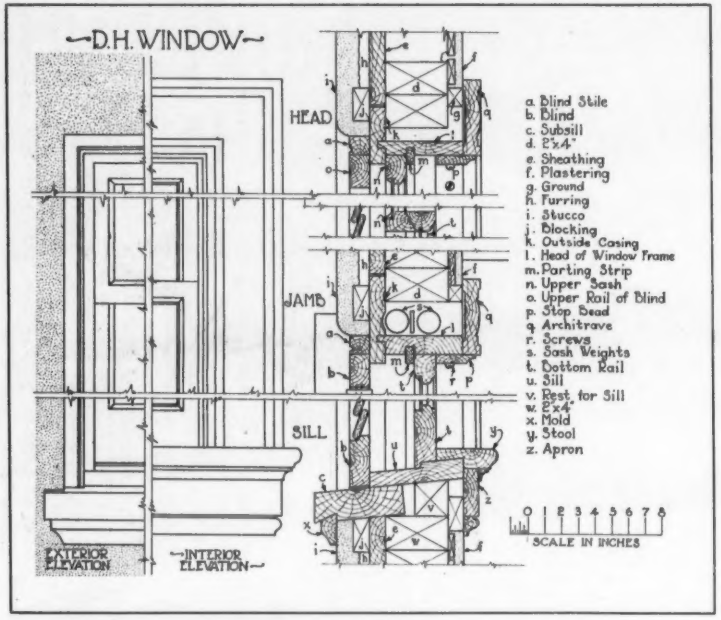
**R. Randolph Karch, Arsenal Junior High School, Pittsburgh, Pennsylvania**

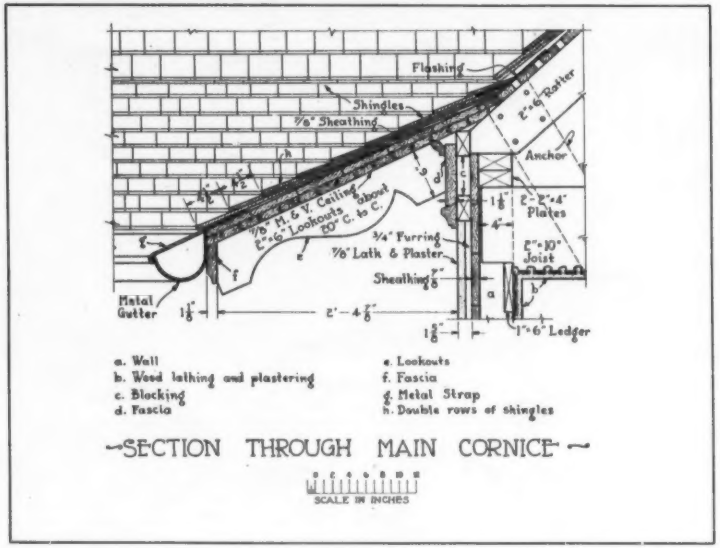
In school shops which have to handle a great deal of production printing, it is rather difficult for the instructor to check back on long runs to see who is to be blamed for careless presswork. The following scheme overcomes this trouble. Each boy, upon finishing his "lift" of sheets, signs his name or initials on the top sheet. In most cases this sheet is soiled in handling anyway, so that not much is lost in throwing it away later.

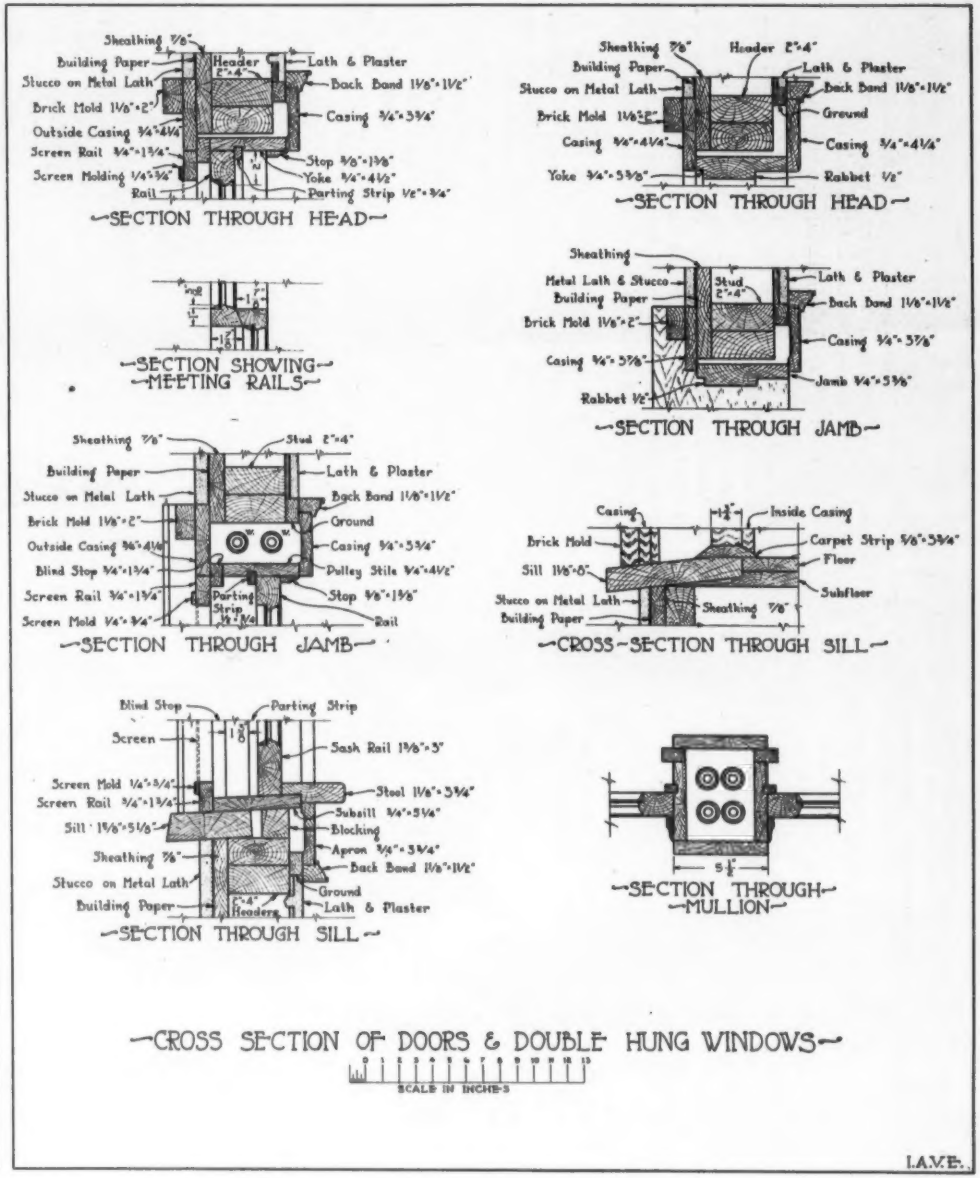
If inferior work is discovered, the boy guilty of it may be interviewed. This assists the student to guard himself against doing the same kind of poor work in the future.

**TIME TO RENEW YOUR MEMBERSHIP**

*During the past year the Red Cross has distributed 10,500,000 barrels of flour and 104,000,000 garments to needy and distressed people. These necessities have gone into every state. Your contribution will help this organization continue its work*




*Architectural-drawing details, submitted by F. M. Keith, Senior High School, Ft. Smith, Arkansas*

# Some Questions Answered

## RAISED LETTER PRINTING

967. Q.: I would like you to explain to me very fully the process of "raised letter" printing. It would be impossible in our school to employ a "Thermograph" machine.

Could we rig up a small electric hotplate (the kind used to heat coffee pots) to do this work? We could use a large furnace, but this might not be very good to use.

Is there a special ink for this process, and if so, where could we get it? — *E.C.V.*

A.: The Engraved Effects Group of the New York Employing Printers Association adopted the term "thermography" to represent the printing process which has been known as "raised printing" in 1928. "Thermography" really means "heat writing."

Thermography covers the process of printing with a slow-drying ink, over which a powder is sprinkled (rosin). A heating process follows which fuses the powder in the ink, and creates a raised surface on the printed letters. The printing is done with ordinary types. The sheets are dusted with powdered rosin, by hand usually, and fed singly into the heating machine on an endless mesh screen. The screen carries the sheets slowly under either a gas or electric heating element. Adjustments must be made to both regulate the speed of the mesh and the heat of the element or gas.

Thermograph machines may be purchased for as little as $65 and up to the automatic duster and heater. On the smaller machines a sort of bin is used in which the powder is placed. The operator takes the printed sheet from the press, shakes onto it some of the powder from the bin, and lays it on the carrier. Some firms manufacturing these machines are as follows: Flexo Manufacturing Co., 35 Howard Street, New York City; Wood, Nathan & Virkus Co., 547 West 23rd Street, New York City; The Embossograph Process Co., Inc., 251 William Street, New York City; and The Automatic Printing Devices Co., 543 Howard St., San Francisco, Calif. These firms will, no doubt, send you information in regard to machines that will aid you in the work.

There is no doubt that this sort of work can be done on homemade devices. Without the special machines, of course, the highest type of work may not be expected. Many amateurs use the regular electric hot plate, and lay the dusted sheets directly upon the stove above the heating element. Scorching must be avoided, and a slow heat is best. If the sheet is placed face down, care must be taken to see that the stove does not smear the ink. We would not advise the using of the large furnace.

There is a special ink for the process: Flexo Printing Ink, Black No. 35. The raising compounds are made in grades to fit the type faces used, as "Very Coarse No. 045" for very bold type; "Coarse No. 8" for bold type; "Medium No. 10" for medium type; "Fine No. 11" for average work; and "Very Fine No. 12" for small type. Both the inks and the powders may be purchased from the Flexo Manufacturing Co., 35 Howard St., New York City. — *R. Randolph Karch.*

## REFINISHING SHELLACKED SURFACES

970. Q.: Last year we turned out a davenport table built of walnut. The procedure of the finish was as follows:

1. Sponged.
2. Sanded lightly, filled with Johnson filler.
3. Coat of shellac wash.
4. Sanded lightly, coat of No. 3 cut white shellac.
5. Sanded lightly, coat of No. 3 cut white shellac.
6. Sanded lightly, coat of No. 3 cut white shellac.
7. Sanded with 6/0 sandpaper and water, and steel wool.
8. Rubbed with FF pumice and rubbing oil. (Rubbing oil made from boiled linseed oil and kerosene.)
9. Polished with a furniture polish.

Since then the finish has turned white and I do not know what to do unless the finish is removed. I have not rubbed this table with any liquids or anything that would destroy the finish. The table has been standing by a window since it was finished and no rain or moisture has touched it. — *L.W.B.*

A.: After reading your specifications for the finish applied to the davenport table, I am convinced that your trouble began in item No. 7 when you used water as a sanding lubricant. Because shellac solutions are highly hygroscopic (water absorbent) due to the alcohol content, the presence of water in any form must be strictly avoided. This applies equally well to the dried film which still retains its hygroscopic property, and under conditions similar to the work done under item No. 7 will precipitate its shellac gum content as an opaque white material.

Occasionally it is possible to restore the transparency by thoroughly cleaning all grease from the surface with a mixture of 1 part turpentine and 3 parts gasoline, drying with soft and clean rags. Then spray the work with high-grade denatured alcohol so as to leave a thoroughly wet surface. This may result in the re-solution of the gum and a subsequent return of the transparency. Several treatments may be required.

If the foregoing suggestions do not bring back the finish, it will be necessary to strip the job with a high-grade varnish remover, using alcohol freely as a wash at the last to take off all traces of the paraffin wax left by the remover. It is also likely that the work will need to be refilled.

For the new finish use shellac from a different manufacturer, a grade of alcohol guaranteed by the manufacturer for this purpose, and a grade of shellac-mixing lacquer as made by Pratt & Lambert or Murphy Varnish companies. Make up the shellac to a 2-lb. cut with the denatured alcohol, and then pour it into an equal volume of shellac-mixing lacquer. Apply with a fitch or other soft-bristle brush. Sand dry between coats with a split 6/0 paper. Use neither water nor oil.

For the final rub use either crude oil or paraffin rubbing oil, reduced if desired with kerosene. Do not use linseed oil or other drying oils as a rubbing medium, as they are almost certain to produce a sticky surface because of the impossibility of entirely removing them. It is correct to use a good polish as a final clean-up.

It is my belief that you will find the use of shellac-mixing lacquer a boon to shop finishing. It is much easier to brush, far easier to sand, rubs nicely and stands hot dishes and marking splendidly. It is proof against water spotting. Because of its fast drying and hardening it will dry dust free. When applied with a sprayer under proper conditions the work will not need to be sanded between coats as each succeeding application will partially dissolve that beneath and leave the final film as a solid coating which can be cut level without sweating. — *Ralph G. Waring.*

# Personal News

¶ Mr. C. L. Wetzel, formerly at the Colorado Agricultural College, Fort Collins, has accepted the position of assistant professor of industrial education at the University of Missouri. Mr. Wetzel will also be state supervisor of trade and industrial education, with headquarters at the University of Missouri, Columbia, Missouri.

¶ Mr. A. E. Schoettler, formerly principal of the Thomas Edison Vocational School at Seattle, Washington, has become head of the day trade department.

¶ Mr. Charles R. Frazier, formerly assistant superintendent of schools of Seattle, Washington, has assumed the duties of principal of the vocational, part-time, and opportunity schools.

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# Associations, Conventions

## WESTERN ILLINOIS TEACHERS ORGANIZE CLUB

The first meeting of the Industrial Education Club of Western Illinois was held May 17 at Moline, with 32 members, representing eight counties, in attendance.

Following the dinner, the acting chairman explained to the group the plans made by the committee. It was suggested that the group meet several times during the year to discuss current industrial-arts problems. Meetings scheduled for the next year will be held at Rock Island, Galesburg, Monmouth, and Kewanee.

The club elected J. Morgan Johnson, Moline, as chairman, and Galen Landis, Kewanee, as secretary-treasurer. The next meeting of the club will be held October 4, at Rock Island. — *J. Morgan Johnson.*

## ALPHA CHAPTER OF IOTA LAMBDA SIGMA MEETS

The members of the Western Section of the Pennsylvania State (Alpha) Chapter, Iota Lambda Sigma, National Industrial Education Fraternity, held their second meeting on Saturday, May 13, at the home of Dr. G. D. Whitney, University of Pittsburgh.

The charter members of the new Industrial Education Club of the University of Pittsburg, which will become affiliated with the Grand Chapter of the new Pitt Chapter of Iota Lambda Sigma were invited guests.

Mr. James Killius, superintendent of schools of Johnstown, gave an informal talk on the aims and purposes of Iota Lambda Sigma. Prof. G. H. Resides, of the Penn State College, talked of the new chapters installed at the Colorado Agricultural College, the University of Akron, the University of Alabama, the University of Tennessee, Clemson College, and Oklahoma A. and M. College.

The meeting was in charge of Mr. Ed. Ciriacy of Aliquippa, and Mr. Sam. C. Mahood of Crafton, Pa. — *S. C. Mahood.*

## PEORIA CLUB HOLDS MEETING AT PEKIN

The final meeting of the Peoria Industrial Education Club for 1933 was held May 3, at Pekin, Illinois. Twenty-five members met at the high school and were conducted on a tour of the Quaker Oats Paper Mill where they watched the steps in the process of making cardboard. Later the group visited the factory of the Corn Products Company where they saw the manufacture of starch from shelled corn.

At the business meeting, Mr. G. Danner was elected chairman, Mr. John Deal, secretary, and Mr. Roper, treasurer. Following the business meeting, the members visited the Insul Power Plant at Powerton where they had a chance to see one of the large up-to-date plants operating under full load. — *F. L. Barloga.*

## WESTERN NEW YORK ASSOCIATION HOLDS MEETING

The Western New York Industrial Arts Association holds its regular monthly meetings at various schools in an effort to acquaint the members with the varied problems of the different communities.

An outstanding feature of the past school year was the meeting held in the Tonawandas. The usual visit to the shops was followed by a dinner. Mr. William Small, deputy superintendent of schools of Niagara Falls, gave a talk on the subject "Keeping Industrial Arts in the Curriculum." Later in the evening Mr. I. C. Perkins, director of industrial education at Buffalo Teachers College, gave an interesting talk on "A New Deal in Industrial Arts."

The officers elected for the coming year are: President, John J. Tuskey, North Tonawanda; vice-president, George L. Willis, Dunkirk; secretary-treasurer, Will Wright, Tonawanda. — *Will Wright.*

# New Publications

**Plants and Design**

By Nettie S. Smith and Dorothea Fricke. Sixteen plates. Price, 50 cents. The Bruce Publishing Company, Milwaukee, Wis.

This series of plates, consisting of original studies of a variety of interesting flowers and plants, offers a large amount of design material for the art instructor. The designs are based upon the wild life of the southwestern states and offer some new material not previously available to artists and designers. The plates are sufficiently varied in scope to offer suggestive material for commercial designers, artists, and art teachers in high schools and colleges.

**Mechanical Drawing — Books I, II, III, and IV**

Books I and II are by Horace E. Boggy, and Books III and IV are by Horace E. Boggy, Herman Z. Denzler, and H. Harold Walter. Paper, 11 by 8½. Price per book, 60 cents. Published by McGraw-Hill Book Company, New York City.

Each of these texts is designed for one semester's work in the mechanical-drawing room, one period a day, five days a week being required for the work.

The assignments are arranged into four problems each: The A problem being for the slow student, the B for the average, C for better than average, and D for the fast student. To keep the class together, it may be necessary at times to assign several of the problems shown on the sheet to the fast student.

**McAdory Art Test**

By Margaret McAdory. Plates measure 9⅜ by 11⅛. Published by Bureau of Publications, Teachers College, Columbia University, New York City.

This objective test, arranged in the multiple-choice form, consists of 72 plates. Directions for giving the test, record sheet, and a scoring stencil are issued with the set. Tentative means for sixth-grade children, college freshmen, college seniors, and competent critics have been established.

**Art Ages**

By Pedro J. Lemos. Portfolio in loose-leaf form measuring 10 by 14. Price, $4.75. Published by The Davis Press, Worcester, Mass.

This collection consists of forty 10 by 14-in. plates covering the 10 great periods of art commencing with the Egyptian era down to the American Colonial times. Four plates cover each of the periods, one showing an example of general architecture, one the costumes of the times, one covering furniture, instruments, tools, and weapons, and one showing architectural decorations. Some of the plates are in colors.

**High School Electricity Manual**

By Walter E. Coburn. Cloth, 135 pages, 5½ by 8⅛, illustrated. Price, $1.35. Published by John Wiley & Sons, Inc., New York City.

This little manual consists of 12 practical jobs which convey in an elementary way the theory of electricity.

**Fabrics and Clothing**

By Sarah MacBride and Ellen B. McGowan. Cloth, 235 pages. The Macmillan Company, New York City.

The theme of this book is intelligent buying and use of textiles for clothing and household purposes. The treatment is quite complete for girls at the junior-high-school level.

(Continued on page 8a)

# TOOLS MUST TEACH ALL THE OPERATIONS

**1934 CATALOG NOW AVAILABLE**

"PERSONS responsible for the expenditure of the money for the support of schools should spend this money as wisely as possible so as to eliminate all possible waste and to secure the greatest return for the money outlay —the tools selected must make it possible to teach all the operations contemplated to the degree of skill required on the material to be used." ROY R. VAN DUZEE, *Supervisor Industrial Arts, West Allis, Wisconsin—Industrial Arts Departmental Supplies, Maintenance, and Equipment, Planning and Accounting—May, 1932, Industrial Arts and Vocational Education.*

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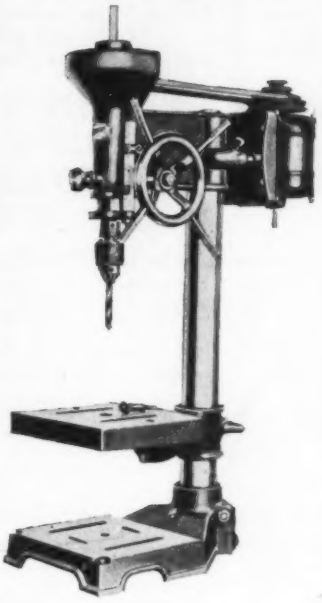

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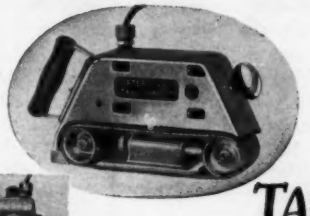

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(Continued from page 6a)

**First Steps in Art and Handwork**

By Ella V. Dobbs. Cloth, 242 pages, 5⅜ by 8, illustrated. Price, $2.00. Published by The Macmillan Company, New York City.

This book is especially adapted for work in the grades. It takes up design, picture making, sand-table representations, working with clay, bookmaking, dramatics, toy making, school exhibits, and school entertainments.

**Strength of Materials**

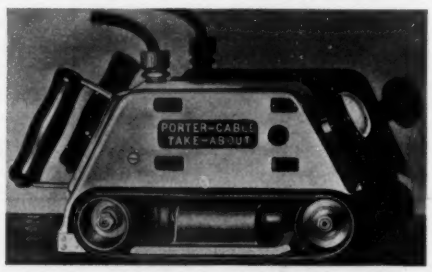
By John Paul Kottcamp and Arthur C. Harper. Cloth, 214 pages, 5½ by 7⅝, illustrated. Price, $1.75. Published by John Wiley & Sons, Inc., New York City.

This book is especially designed for classes of machine design in which the strength of materials is taken up. Simple stresses, materials of construction, riveted joints, the beam theory, design of beams, study of deformation, combined stresses, columns, and reinforced concrete are adequately covered for work on the technical-high-school and part-time or full-time vocational-school level.

# SchoolShopEquipmentNews

## NEW TAKE-ABOUT ELECTRIC SANDER

The Porter-Cable Machine Company, Syracuse, N. Y., has just issued its new Take-About Sander, Type T-3, which is an improvement in design over previous types.




*Take-About Sander*

The Type T-3 design follows closely that of the Type B-10, but has added advantages, including greater power, light weight, low operating cost, improved cooling facilities, absence of adjusting nuts and screws, inclosed ball bearings, and drop-forged duralumin idler-pulley arm for insuring ease of belt tracking.

The main feature of the Type T-3 design is its fine balance, which is accomplished by placing the motor in a horizontal position, making it operative under the most highly efficient conditions. The use of the sander is not limited to wood alone, but may be adapted to any material, either flat or curved. The sander saves a great deal of time over hand scraping, planing, and surfacing.

Complete information is available for any shop instructor upon request.

## NEW BALSA WOOD BOOKLET

The Balsa Wood Company, Inc., of Brooklyn, N. Y., has issued a seven-page booklet, describing the character and uses of balsa wood. The booklet tells how balsa wood is selected and processed, what its properties are, and its special applications in the shop.

The company furnishes balsa wood on a carefully classified basis, with variations in weight, texture, strength, hardness, and buoyancy according to requirements. It is available in thicknesses up to 4 in., in widths up to 8 in., and in lengths up to 14 ft.

## ANNOUNCE HIGGINS PRIZE CONTEST IN MECHANICAL DRAWING

The Charles M. Higgins Company, Inc., Brooklyn, N. Y., manufacturers of Higgins' writing and drawing inks, has an-

(Continued on page 9a)

(Continued from page 8a)

nounced its annual prize contest in mechanical drawing, to be held again this year. The contest created a good deal of interest in mechanical-drawing classes last year.

The firm has announced that it will give a number of cash prizes, medals, and drawing sets to the winners of the contest.

Complete details about the contest may be obtained by teachers and students from the Charles M. Higgins Company, Inc., 271 Ninth St., Brooklyn, N. Y.

### CATALOG OF SUPPLIES FOR INDUSTRIAL ARTS

The H. L. Wild Company, 510 East Eleventh St., New York City, has just issued its new catalog No. 50a, illustrating and describing a variety of supplies for industrial-arts classes, including woods, hardware, tools, and other materials for woodworking, wood carving, chip carving, inlaying, fretwork, and pyrography.

## News Notes

**Selling the School Shop**

As a means of keeping the community in touch with the work of the vocational-education department of the Miami, Florida, schools, Mr. J. I. Sowers, supervisor of vocational education, gave weekly radio addresses over station WIOD. The series was begun in June and will continue through the summer to the end of September.

**Summer Session at Stout Institute**

During the twenty-eighth annual summer session of The Stout Institute, Menomonie, Wis., 174 men registered in the School of Education, and 128 women in the School of Home Economics. The students enrolled came from 24 states and Hawaii.

Statements of numerous students showed that failure of salary payments and payments of salary in tax warrants and scrip made the problem of summer-school attendance a difficult one.

**Prizes Awarded at Printing Conference**

At the printing conference, held at Columbia University, prizes were awarded to the winners in each special group. A total of 40 competitors participated in each group representing junior high and elementary schools, senior high schools, vocational schools, and colleges.

**Edison Vocational School Has Increase in Enrollment**

The Thomas Edison Vocational School, Seattle, Wash., closed its third year of operation, with a large percentage of the students actually employed despite the depression. During the past year the school had an increase of 20 per cent in its day trade classes. At the same time, the per-pupil cost of operation was reduced almost 30 per cent. With the opening of the new school year, the teaching staff has been reorganized as part of an economy program for reducing the administrative costs in the city schools.

**New Courses at Fort Thomas, Kentucky**

Home economics, and industrial arts have been added to the course of study of the Highlands High School, Fort Thomas, Kentucky. Under the program, home economics will be offered to all girls of the eighth, ninth, and tenth grades; shopwork to boys of the same grades; and mechanical drawing to both boys and girls of grades eleven and twelve. Mr. A. W. Rader has been appointed instructor for the industrial-arts work and mechanical-drawing classes, and Miss Louella Greeno for the home-economics classes.

(Continued on page 11a)

Teach WROT IRON
and stay within your BUDGET

DO YOU KNOW
Our Wrot Metal Designs?
That any Boy can execute them?
That you have the Required Tools right in your shop?
That to use our Service means Economy and added Interest?

ARE YOU FAMILIAR
With our Full Service?
With the Helping Features offered?

IF NOT
Write at once for interesting Detail and free Literature.

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Nineteenth Annual Catalog of "Hard-to-Get" Materials

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*Jobbers and Manufacturers*
ANOKA MINNESOTA

INDUSTRIAL ARTS AND MANUAL TRAINING SUPPLIES

SPECIAL *Send 25 cents for 15-page illustrated folder "Art Metal Craft Work."*

We carry the country's most complete stock of art metal tools, small motor-driven metal and wood-working machines, general hardware and Manual Training supplies; also brass, copper, pewter, sterling silver, nickel silver, aluminum and steel, available in strips, sheets, bars, wire, rods and tubing. Let us quote on your needs. Write for a list of our Technical Books.

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# The School Shop Shopping Guide

**FREE SAMPLES**

for teachers of auto mechanics and their students

*Teachers: How many students have you?*

GASKET
GOO
QUICKLY MAKES A BETTER GASKET THAN CORK, PAPER, RUBBER OR ASBESTOS
NOT AFFECTED BY HEAT, OIL, WATER, GASOLINE OR HIGH PRESSURE
Pep Mfg. Co.

*Write*

**PEP MFG. CO.**

*INCORPORATED*

33 W. 42nd St.

New York

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**WANTED**

*A School Shop Man for an Executive Sales Position*

We have an opening in our organization for a man well conversant with the requirements of vocational and manual training schools, to promote the sale of woodworking machinery to them through a large selling force. Must be thoroughly experienced and capable. Full particulars regarding experience, ability, education, salary expected, references, must be given in first letter. Our organization has been acquainted with this advertisement. Address Dept. M-10, Industrial Arts and Vocational Education, Milwaukee, Wis.

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**New Motor-Driven Woodworking Tools**

New 1933 line of "Delta" Quality Tools includes improved motor-driven Jointers, Band Saws, Circular Saws, Lathes, Drill Press, Moulding Cutters, Scroll Saws, and Boring, Routing, Mortising, Sanding Attachments — and complete line of accessories—all at new low price levels.

**FREE Catalog**

Send TODAY for FREE illustrated 48-page Catalog, and full details of 10-Day Trial Offer and Easy Payment Plans. You will not be obligated in any way.

**Delta Manufacturing Co.**

Dept. E-1033

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*New!*

**WET STONE GRINDER With Tool Holder**

General Electric 1/6 HP Motor Weight 95 lbs. Dimensions 22″ x 8½″ x 13″. Wheel-Sandstone: 12″ x 1¾″ x ¾″: 87 RPM.
Also furnished without tool holder.

*See our advertisement page 99 School Shop Annual.*

**THE STANDARD ELECTRICAL TOOL CO.**
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**ELECTRO-TYPERS**

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

**Badger Electrotype Co.**
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

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**WEAVING**

*is today becoming increasingly popular in schoolwork*

There are 5 simple reasons: 1) It's a most practical training in mind and muscle coördination. 2) It offers scores of practical projects. 3) It is economical. 4) No special power or equipment needed. 5) Grand Rapids simplified instructions make it easy for all to learn. Don't delay finding how easily and quickly you can offer this ideal subject to your classes.

**Send Today for Our 1933 Catalog**

Shows over 100 practical projects your classes can make; tells all about this fascinating work.

**Use this Coupon NOW**

**Grand Rapids Fibre Cord Co.**
**Dept. A, 609 Myrtle Street**
**Grand Rapids, Michigan**

Rush a copy of your 1933 Catalog.

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School.....

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**» » Lumber « «**

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**The O'BRIEN LUMBER CO.**
**2655 S. ROBEY ST., CHICAGO**

Operating our own kilns assures you of dryness. Deal with a house known a half century for Quality and Service.

DOMESTIC HARDWOODS
MAHOGANY

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**T. A. Foley Lumber Co.**

We Furnish Schools With

*Lumber, Panels, Dowels and Cedar Chests*

PARIS, ILLINOIS

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**CEDAR CHESTS—CABINETS**

Genuine Aromatic Moth Killing Tennessee Red Cedar—kiln dried, glued-up, planed, cut-to-size—for chests.
Also, Cherry, Walnut, and Maple for cabinets and furniture tops.
Write for illustrated folder.

**HARTLEY AKIN LUMBER CO.**
Cincinnati, Ohio

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**Frank Paxton Lumber Co.**

Hardwoods « » Softwoods
Panels

Kansas City, Kansas

(Continued from page 9a)

**Hold Guidance Conference**

A successful guidance conference was held at Stanford University, California, during the month of July. Approximately 100 persons were in attendance at the conference, in addition to 50 students who regularly participate in the conference program.

**Industrial-Arts Exhibit at New York University**

The third annual industrial-arts exhibit and conference was held May 13 at New York University. The auditorium program was held on the main floor of the School of Education Building. Dr. Ralph E. Pickett, of New York University, gave the address of welcome, and Mr. Lester Cummins, of Newark, New Jersey, spoke on "High Lights of Electricity." Mr. Frederick W. Landers, of New York University, gave the summary of the meeting.

**First Model Exhibit in Winnipeg**

The exhibition hall in the Civic Auditorium at Winnipeg, Canada, was given over during Easter Week to a combined exhibit of industrial-arts projects and scale models of every description. The models ranged in size from stationary steam engines, weighing less than a pound, to a 3-ft. model of the Royal Scot, now being exhibited at the Century of Progress Exposition. There were also scenic railways, aircraft models, and a model of Washington's home built by the children in the Baltimore schools.

The industrial-arts section, which occupied more than half of the 80,000 square feet of floor space, included 3,500 exhibits covering aluminum models, a wide variety of lathes, drills, shapers, milling machines, jointers, ornamental iron work, and numerous sheet-metal and furniture projects. The exhibit was visited by 85,000 people and was a feature of the annual meeting of the Manitoba Industrial-Arts Association.

**A Survey of Industrial Work in the Schools of Northern Illinois**

By Paul E. Harrison. Paper, 11 pages. Issued by the Northern Illinois State Teachers College, DeKalb, Ill.

The survey was made to determine the following:

1. Professional training, teaching experience, and salaries of instructors teaching in the schools of northern Illinois.
2. Courses that these instructors have found most helpful in their teaching.
3. How these teachers spent the 1930 summer vacation period.
4. Courses offered in the school in which the teachers surveyed were teaching; the time spent in the shops by the students, and the grades in which the courses are offered.
5. Reasons for the offering of the various courses in the different communities of northern Illinois.

**Commercial Lapping for Close Limits and High Production**

Issued by the Norton Company, Worcester, Mass. The art of lapping has been developed during a long period of years to a point where it is now a machine-production operation and is available in large industrial plants as a supplement to the work of the grinding machine. The pamphlet is divided into two parts. Part I takes up the origin and development of lapping, fields of use, advantages, and methods. Part II takes up the classification of types of machines, preparation of parts

**Occupational Information on Aëronautics**

The city schools employment department of the Davis Vocational High School, Grand Rapids, Mich., with the coöperation of Supt. L. A. Butler, Mr. G. B. Frazee, principal, and Mr. G. F. Johnson, placement director, recently undertook the preparation of a pamphlet on the aëronautical occupations. The pamphlet discusses the qualifications, the training, and the salaries for pilots and aviation motor mechanics. There is appended a list of helpful books on the subject.


***PRINTING INK VALUES***

**Use correct inks to give desired result on paper used. Advise with manufacturer who knows.**

**Our reputation has been attained by close association with the largest printers of the world.**

***Tell us your problems, we will freely advise.***

**FRED'K H. LEVEY CO., INC.**

*Printing Inks of all Discriptions*

59 Beekman St., New York City
1223 Washington Ave., Philadelphia, Pa.
221 E. 20th St., Chicago, Ill.

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**For Craft Workers**

**A 5-cent stamp brings you samples**

***Sold by the whole or half skin, also cut to measure***

**Tools, designs, lacings, both in Calf and Goat skin, Snap Fasteners to match leathers, Leather Dye, Wax Polish, Sphinx Paste, Slide Fasteners and Bag Plates.**

**W. A. HALL**
**250 Devonshire St. Boston 9, Mass.**


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# The School Shop Shopping Guide

## Students Too?

Do students fight for the HOLD-HEET Glue Pots, too? The Beshel Cabinet Works, New Orleans, recently wrote: "We first noticed that the HOLD-HEET Pots were superior in every way after finding our men arguing over who should get them to use." Most woodworking plants and up-to-date schools now standardize on HOLD-HEET Pots.

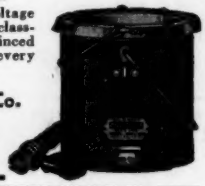
**HOLD-HEET Glue Pots**

1 qt. . $14
2 qt. . $17
4 qt. . $24
8 qt. . $36

*115 or 230 Volts*

*30-Day Free Trial*

Just write size and voltage wanted. Test it in the classroom and if not convinced that it is "superior in every way," send it back.



**Russell Electric Co.**
364 W. Huron St.
CHICAGO, U. S. A.
*Sold by Jobbers*

## KNIVES OF QUALITY

For Sloyd and Manual Training work, there are no finer knives made than Robert Murphy's.

Over 83 years of experience, research and experimentation enable us to offer knives of guaranteed quality. Every blade is especially processed of the finest steel to stand the gaff of school shop use and STAY SHARP.

*Write for a catalog of our complete line*

**ROBERT MURPHY'S SONS CO.**
AYER, Established 1850 MASS.

## VANDERCOOK

PROOF PRESSES

A School Shop Essential

No. 1

VANDERCOOK & SONS, Inc.
910 N. Kilpatrick Ave.
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## MR. SHOP TEACHER

Send for 1933-34 folder of NEW VASCO Electrical and Mechanical PROJECTS.

**Vocational Arts Supply Company**
939 W. 12th St. Los Angeles

## COLUMBIAN VISES

*All Styles and Sizes for Every Shop Need.*

Made by
The Columbian Vise & Mfg. Co.
9017 Bessemer Ave. Cleveland, Ohio

# Keeping Up-to-date on Adhesives

THE manufacturers of CASCO GLUE (dry powder cold-water-mix casein glue) offer these facilities, *free of cost,* to Shop Instructors.

- **FREE SAMPLES OF CASCO**
  The regular CASCO Waterproof Glue or the new CASCO No. 2 White (stain-free) Glue.
- **FREE BOOKLETS AND BULLETINS**
  CASCO GLUING GUIDE—50 pages—75 illustrations—over 50 uses for CASCO Glue—and how to make Waterproof Crack Filler.
  GLUING JIG-SAW PUZZLES—new 4-page bulletin.
- **MAILING LIST**
  Free listing to receive "The CASCO Idea" (bi-monthly), also "The CASCO Red Book," a manual of factory gluing practice.

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205 East 42nd St., New York, N. Y. I.A.-10-33
Send me free sample of
CASCO Waterproof Glue ☐ Please check
CASCO No. 2 White Glue ☐ whichdesired
also
"CASCO Gluing Guide" ☐
"Gluing Jig-Saw Puzzles" ☐
and
Place my name and address on mailing list as follows:
*Name*.....
*Street*.....
*Post Office*.....
*School*.....

## "Jorgensen" CLAMPS

TRADE MARK REG U S PAT OFF

*All Types* *Standard Equipment throughout Industry*

Clamps of all types and sizes—all Jorgensen Quality. Each safe, strong, handy—exactly suited to its use. Jorgensen Steel Bar Clamps have patented Multi-disc Clutch—slide to position *and hold.* Write for Catalog of standard and special shapes.

**ADJUSTABLE CLAMP COMPANY**
*The Clamp Folks*
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## PEWTER AND BRITANNIA METAL

Sheets: 24"x36" or smaller
Circles: 2" to 24" diameter
Specify size and gauge.

NATIONAL LEAD CO., DEPT. P
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Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair, Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

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## COMPLETE NEW CATALOG OF

**Snap-on** INTERCHANGEABLE Socket Wrenches
**Blue-Point** Mechanic Tools

**Every School Shop Instructor Should Have This Book**

Write at once for your copy and ask for our special detailed School Budget Plan. There is no obligation incurred and we shall be very glad to be of service to you.

**SNAP-ON TOOLS, Inc.**
KENOSHA, WIS.

## Instruction Sheets in Woodworking

UNIT OPERATION SERIES I—Ten sheets on ten common operations.
INTER. PROJECT SERIES VIII—Six projects on ten sheets. PRICES—1 set $.50; 3—$1.00; 10—$2.50. 50—$9.00; 100—$15.00; Prepaid. 500 sets $37.50; 1000—$60.00; 5000—$175.00; 10,000—$250.00; F.O.B., N.Y.C. Club plan; 100 teachers at $2.50 ea. buys 10,000 sets or 100 sets ea. at .025 a set. Money orders are preferred.
CLIFFORD B. SMITH, 516 Dartmouth St., Buffalo, N.Y.
*Blue Eagle applied for*

## ART METAL and JEWELRY WORK

*Equipment and Supplies*

Tools of all kinds for Jewelry, Silver, and Copper, Rose Hammers and Anvils. When ordering be sure to

**SPECIFY "ROSE"**

Gold, Silver, Copper, Brass, Pewter, and Nickel Silver in sheet and wire form. Semi-Precious stones. Send for our catalog B. Ask for a sample copy of our Brochure, "Things In and About Metal," sent free.

**METAL CRAFTS SUPPLY CO.**
Providence, R. I.

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and Blue Prints for a Complete line of HOMEWORK SHOP MACHINES-Free catalogue

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By man well known and highly successful in industrial education and vocational work. Has long been considered an authority in this field of school work. Practical and original in his work. Would be adapted to position in organization, supervision, vocational guidance, personnel work, teacher, salesman of supplies and machinery for shops, or directing advertising campaign.

Address Dept. M-11 Industrial Arts and Vocational Education, Milwaukee, Wis.

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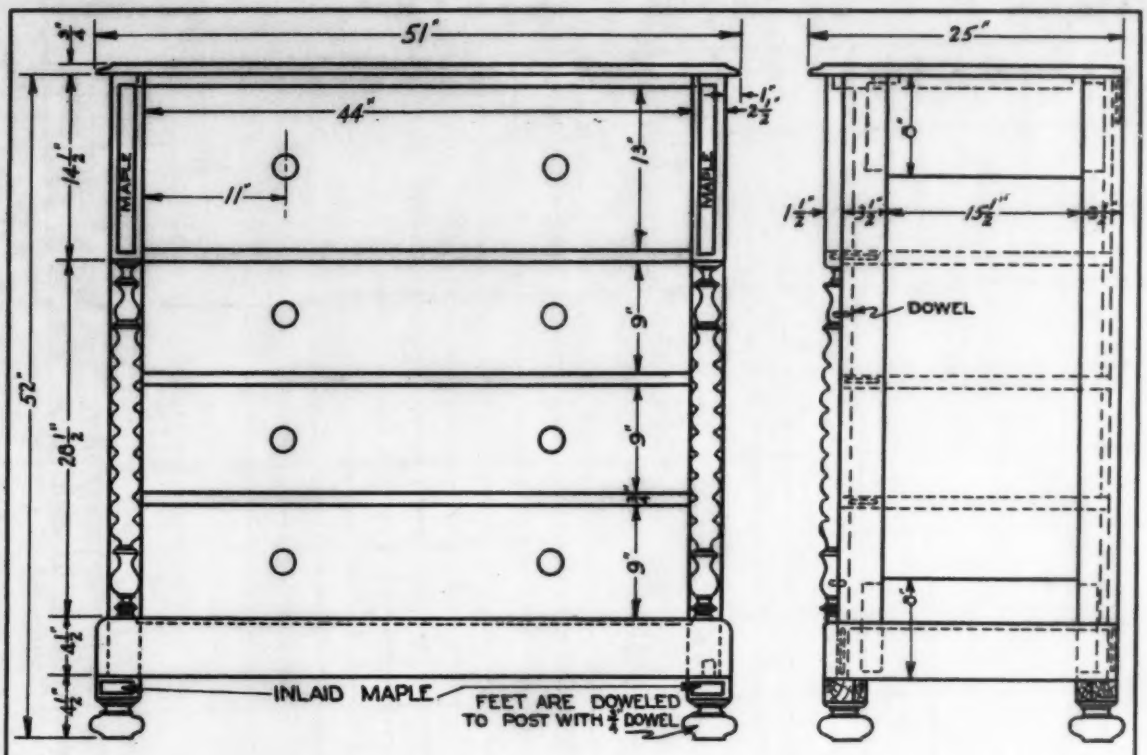
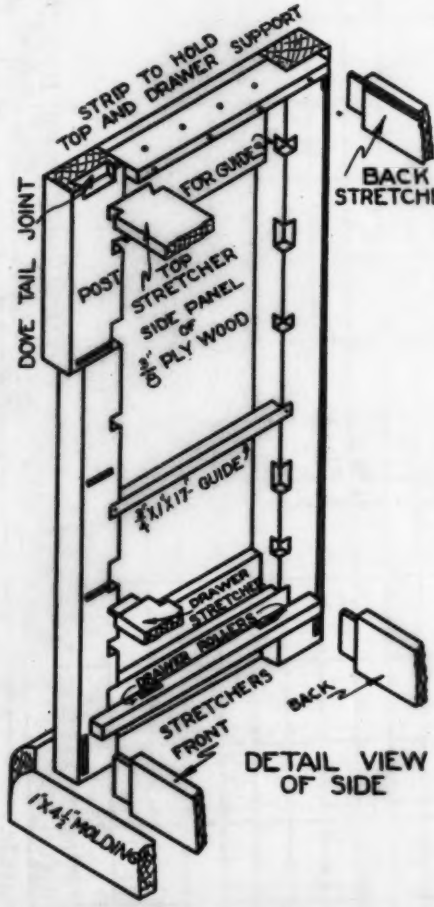
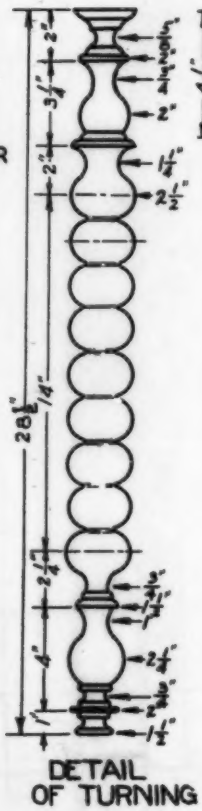



DETAIL VIEW OF SIDE

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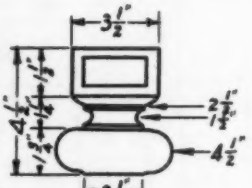


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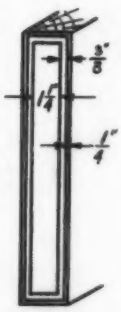
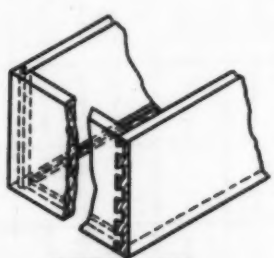



DETAIL OF POST

DETAIL OF DRAWER ROLLERS



DETAIL OF DRAWER

# CHEST OF DRAWERS

Designed by Harry F. Mergler, Chillicothe, Ohio

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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Oct. 1933

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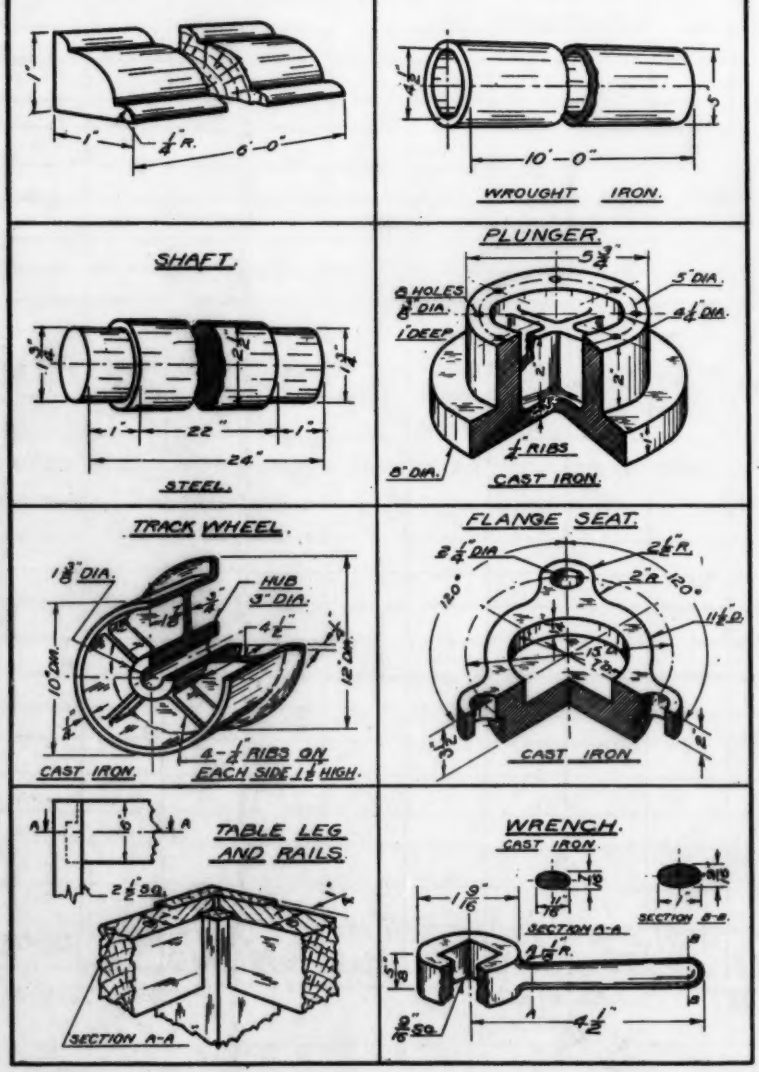


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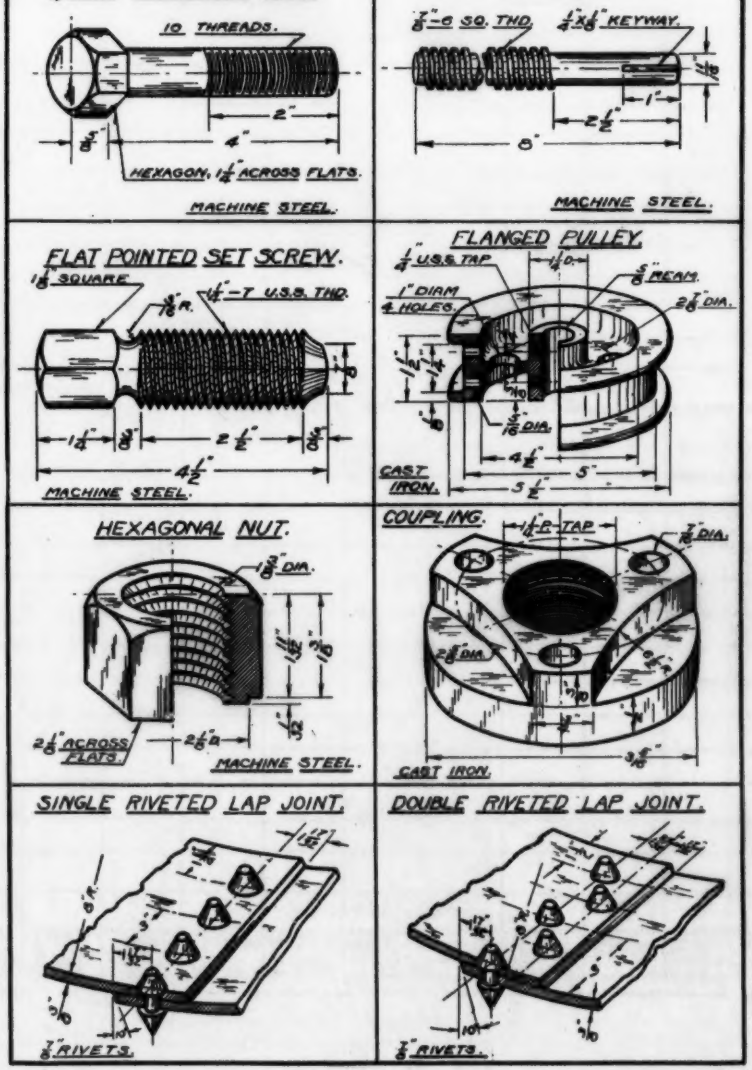


Submitted by Jonathan Bright, Erie, Pennsylvania

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